

AutoCAD MEP 2008

Electrical Tutorial

The Autodesk logo is displayed in white text on a black rectangular background. The word "Autodesk" is written in a sans-serif font, with a registered trademark symbol (®) at the end. The logo is oriented vertically, reading from bottom to top.

April 2007

Copyright© 2007 Autodesk, Inc.

All Rights Reserved

This publication, or parts thereof, may not be reproduced in any form, by any method, for any purpose.

AUTODESK, INC., MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING THESE MATERIALS, AND MAKES SUCH MATERIALS AVAILABLE SOLELY ON AN "AS-IS" BASIS.

IN NO EVENT SHALL AUTODESK, INC., BE LIABLE TO ANYONE FOR SPECIAL, COLLATERAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF PURCHASE OR USE OF THESE MATERIALS. THE SOLE AND EXCLUSIVE LIABILITY TO AUTODESK, INC., REGARDLESS OF THE FORM OF ACTION, SHALL NOT EXCEED THE PURCHASE PRICE OF THE MATERIALS DESCRIBED HEREIN.

Autodesk, Inc., reserves the right to revise and improve its products as it sees fit. This publication describes the state of the product at the time of publication, and may not reflect the product at all times in the future.

Autodesk Trademarks

The following are registered trademarks of Autodesk, Inc., in the USA and/or other countries: 3D Props, 3D Studio, 3D Studio MAX, 3D Studio VIZ, 3DSurfer, 3ds max, ActiveShapes, ActiveShapes (logo), Actrix, ADI, AEC Authority (logo), AEC-X, Animator Pro, Animator Studio, ATC, AUGI, AutoCAD, AutoCAD LT, AutoCAD Map, Autodesk, Autodesk Envision, Autodesk Inventor, Autodesk (logo), Autodesk Map, Autodesk MapGuide, Autodesk Streamline, Autodesk University (logo), Autodesk View, Autodesk WalkThrough, Autodesk World, AutoLISP, AutoSketch, backdraft, Bipod, bringing information down to earth, Buzzsaw, CAD Overlay, Character Studio, Cinepak, Cinepak (logo), cleaner, Codec Central, combustion, Design Your World, Design Your World (logo), EditDV, Education by Design, gmax, Heidi, HOOPS, Hyperwire, i-drop, Inside Track, IntroDV, Kinetix, lustre, MaterialSpec, Mechanical Desktop, NAAUG, ObjectARX, Physique, Planix, Powered with Autodesk Technology (logo), ProjectPoint, RadioRay, Reactor, Revit, Softdesk, Texture Universe, The AEC Authority, The Auto Architect, VISION*, Visual, Visual Construction, Visual Drainage, Visual Hydro, Visual Landscape, Visual Roads, Visual Survey, Visual Toolbox, Visual Tugboat, Visual LISP, Volo, WHIP!, and WHIP! (logo).

The following are trademarks of Autodesk, Inc., in the USA and/or other countries: AutoCAD Learning Assistance, AutoCAD LT Learning Assistance, AutoCAD Simulator, AutoCAD SQL Extension, AutoCAD SQL Interface, AutoSnap, AutoTrack, Built with ObjectARX (logo), burn, Buzzsaw.com, CAICE, Cinestream, Civil 3D, cleaner central, ClearScale, Colour Warper, Content Explorer, Dancing Baby (image), DesignCenter, Design Doctor, Designer's Toolkit, DesignKids, DesignProf, DesignServer, Design Web Format, DWF, DWFit, DWG Linking, DXF, Extending the Design Team, GDX Driver, gmax (logo), gmax ready (logo), Heads-up Design, jobnet, ObjectDBX, onscreen onair online, Plans & Specs, Plasma, PolarSnap, Productstream, Real-time Roto, Render Queue, Visual Bridge, Visual Syllabus, and Where Design Connects.

Autodesk Canada Co. Trademarks

The following are registered trademarks of Autodesk Canada Inc. in the USA and/or Canada, and/or other countries: discreet, fire, flame, flint, flint RT, frost, glass, inferno, MountStone, riot, river, smoke, sparks, stone, stream, vapour, wire.

The following are trademarks of Autodesk Canada Inc., in the USA, Canada, and/or other countries: backburner, Multi-Master Editing.

Third Party Trademarks

All other brand names, product names or trademarks belong to their respective holders.

Third Party Software Program Credits

ACIS Copyright© 1989-2001 Spatial Corp. Portions Copyright© 2002 Autodesk, Inc.

Copyright© 1997 Microsoft Corporation. All rights reserved.

Flash ® is a registered trademark of Macromedia, Inc. in the United States and/or other countries.

HLM ® Copyright D-Cubed Ltd. 1996-2006. HLM is a trademark of D-Cubed Ltd.

2D DCM ® Copyright D-Cubed Ltd. 1989-2005. 2D DCM is a trademark of D-Cubed Ltd.

International CorrectSpell™ Spelling Correction System© 1995 by Lernout & Hauspie Speech Products, N.V. All rights reserved.

InstallShield™ 3.0. Copyright© 1997 InstallShield Software Corporation. All rights reserved.

PANTONE® Colors displayed in the software application or in the user documentation may not match PANTONE-identified standards. Consult current PANTONE Color Publications for accurate color.

PANTONE® and other Pantone, Inc. trademarks are the property of Pantone, Inc.© Pantone, Inc., 2002

Pantone, Inc. is the copyright owner of color data and/or software which are licensed to Autodesk, Inc., to distribute for use only in combination with certain Autodesk software products. PANTONE Color Data and/or Software shall not be copied onto another disk or into memory unless as part of the execution of this Autodesk software product.

Portions Copyright© 1991-1996 Arthur D. Applegate. All rights reserved.

Portions of this software are based on the work of the Independent JPEG Group.

RAL DESIGN© RAL, Sankt Augustin, 2002

RAL CLASSIC© RAL, Sankt Augustin, 2002

Representation of the RAL Colors is done with the approval of RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V. (RAL German Institute for Quality Assurance and Certification, re. Assoc.), D-53757 Sankt Augustin.

Typefaces from the Bitstream® typeface library copyright 1992.

Typefaces from Payne Loving Trust® 1996. All rights reserved.

AutoCAD 2008 is produced under a license of data derived from DIC Color Guide® from Dainippon Ink and Chemicals, Inc. Copyright © Dainippon Ink and Chemicals, Inc. All rights reserved. DIC Color Guide computer color simulations used in this product may not exactly match DIC Color Guide, DIC color Guide Part 2 identified solid color standards. Use current DIC Color Guide Manuals for exact color reference. DIC and DIC Color Guide are registered trademarks of Dainippon Ink and Chemicals, Inc.

Printed manual and help produced with Idiom WorldServer™.

WindowBlinds: DirectSkin™ OCX © Stardock®

AnswerWorks 4.0 ©; 1997-2003 WexTech Systems, Inc. Portions of this software © Vantage-Knexys. All rights reserved.

The Director General of the Geographic Survey Institute has issued the approval for the coordinates exchange numbered TKY2JGD for Japan Geodetic Datum 2000, also known as technical information No H1-N0.2 of the Geographic Survey Institute, to be installed and used within this software product (Approval No.: 646 issued by GSI, April 8, 2002).

Portions of this computer program are copyright © 1995-1999 LizardTech, Inc. All rights reserved. MrSID is protected by U.S. Patent No. 5,710,835. Foreign Patents Pending.

Portions of this computer program are Copyright ©; 2000 Earth Resource Mapping, Inc.

OSTN97 © Crown Copyright 1997. All rights reserved.

OSTN02 © Crown copyright 2002. All rights reserved.

OSGM02 © Crown copyright 2002, © Ordnance Survey Ireland, 2002.

FME Objects Engine © 2005 SAFE Software. All rights reserved.

GOVERNMENT USE

Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in FAR 12.212 (Commercial Computer Software-Restricted Rights) and DFAR 227.7202 (Rights in Technical Data and Computer Software), as applicable.

Contents

- Chapter 1 Starting an Electrical Drawing 1**
 - Using This Tutorial 2
 - Lesson 1: Starting a Drawing 3
 - Exercise 1: Specifying a Project 3
 - Exercise 2: Specifying a Template 6
 - Exercise 3: Viewing Configuration Settings 7
 - Exercise 4: Inserting a Referenced Drawing 10
- Chapter 2 Drawing a Lighting Plan 13**
 - Lesson 2: Lighting for Lab 247 14
 - Exercise 1: Adding Panels and Circuits 14
 - Exercise 2: Adding Lights 19
 - Exercise 3: Adding Can Lights 29
 - Exercise 4: Finishing the Lab 247 Lighting 34
 - Lesson 3: Lighting for Lab Support 39
 - Exercise 1: Adding Lights 39
 - Exercise 2: Adding Emergency Lighting 42
 - Exercise 3: Adding Junction Boxes and Switches 44
 - Exercise 4: Wiring Lab Support Lighting 44
- Chapter 3 Drawing a Power Plan and a Schematic Diagram 49**
 - Lesson 4: Drawing a Power Plan 50
 - Exercise 1: Generating Receptacles in a Room 50
 - Exercise 2: Manually Placing Receptacles 54
 - Exercise 3: Customizing a Device Style 57
 - Lesson 5: Drawing a Schematic Diagram 58
 - Exercise 1: Starting the Schematic Diagram 58
 - Exercise 2: Continuing the Diagram 61
 - Exercise 3: Completing the Diagram 64
- Chapter 4 Creating Electrical Construction Documents 67**
 - Lesson 6: Creating Electrical Views 68
 - Exercise 1: Creating an Electrical Plan View 68
 - Exercise 2: Adding a Detail View 72
 - Exercise 3: Creating a Panel Schedule 76
 - Exercise 4: Creating an Equipment Schedule 77
 - Exercise 5: Creating a Power Plan View 78
 - Exercise 6: Creating a Power Diagram View 79
 - Lesson 7: Creating Electrical Sheets 79
 - Exercise 1: Creating an Electrical Plan Sheet 79
 - Exercise 2: Creating a Detail Sheet 83
 - Exercise 3: Creating a Panel Schedule Sheet 84
 - Exercise 4: Creating a Schedule Sheet 84
 - Exercise 5: Creating a Power Plan Sheet 85
 - Exercise 6: Creating a Power Diagram Sheet 85
 - Exercise 7: Creating a Cover Sheet 85
 - Exercise 8: Publishing the Sheet Set 87

Starting an Electrical Drawing

In this tutorial, you learn how to create part of an electrical system for a research laboratory. In the process, you learn the primary concepts of how to use AutoCAD MEP to draw electrical systems and produce construction documents.

In the lessons in this chapter, you learn how to start a drawing. You also learn how to work with projects and reference a floor plan drawing.

Using This Tutorial

This tutorial is divided into lessons, each of which addresses a particular task. Each lesson contains step-by-step exercises you can perform to achieve the goal of the lesson. Drawings, referred to as datasets, are included in the project files. You must extract the project files in order to complete any part of this tutorial. You can complete the tutorial from beginning to end or, if you are an experienced user, you can proceed to a specific lesson.

The lessons in this tutorial are designed to build upon your knowledge of AutoCAD®. If you are not familiar with basic AutoCAD functions and commands, see the AutoCAD® Help. These lessons also assume you are familiar with basic AutoCAD MEP features such as tool palettes, the Properties palette, and MEP snaps. If you are not familiar with these features, see “Getting Started” in the AutoCAD MEP Help.

Extracting the Project Datasets

You must extract the project files in order to complete any part of this tutorial. If you edit any of the project files, you can extract the files again to reset the project to its original state. You can search My Documents\Autodesk\MyProjects to see if the Electrical Tutorial dataset has already been extracted.

To extract the project datasets, open your browser to the following URL: <http://www.autodesk.com/autocadmep-tutorials>. Locate the tutorial ZIP file for your language; for example, the English language version of the tutorial files is `english_tutorials_AutoCAD_MEP_2008.zip`. Follow the steps in the corresponding `readme.txt` file to download the ZIP file and extract its contents to your hard drive.

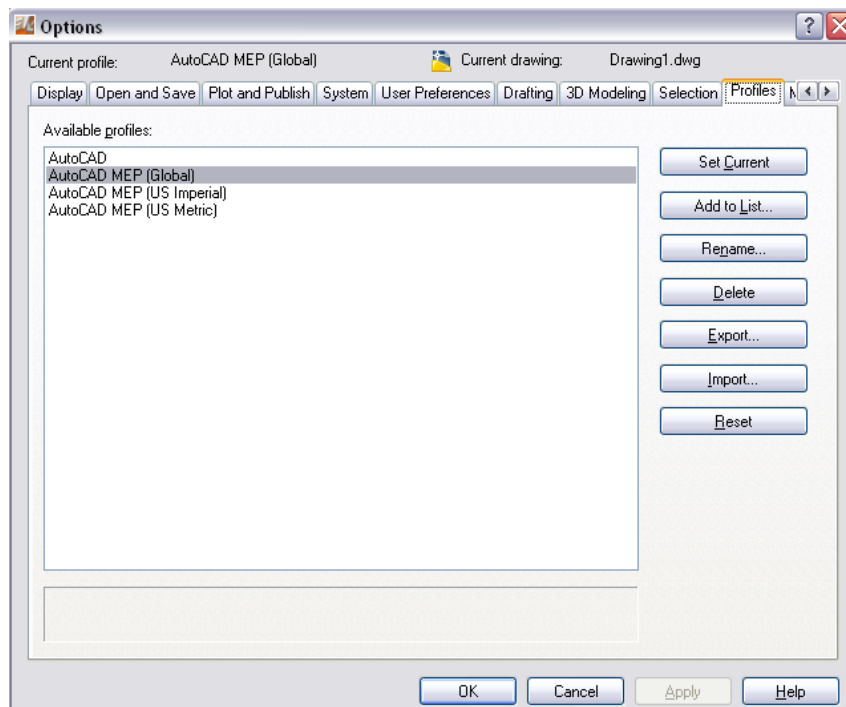
Working with Metric Content

This tutorial requires that the Global content pack be installed as part of the AutoCAD MEP installation for your workstation. The Global content pack is made up of metric content, metric templates, and an AutoCAD MEP (Global) user profile.

While you may be accustomed to using imperial units in your day-to-day work, the lessons in this tutorial cover all of the same tasks necessary for you to complete designs and create construction documents using either metric or imperial units.

Verifying the Current Profile

In order to complete the tutorial, you must have your current profile set to AutoCAD MEP (Global). To check the profile setting, in AutoCAD MEP click Format menu ► Options. The name of the current profile is indicated at the top of the Options dialog.



If AutoCAD MEP (Global) is not the current profile, select it from the list, and click Set Current. If AutoCAD MEP (Global) is not listed as a choice in the Options dialog, this means that the Global content pack was not installed when AutoCAD MEP was installed on your workstation.

To add the Global content pack to your AutoCAD MEP installation at any time, rerun the installer, and select the Add or Remove Features option. To rerun the installer, open the Add or Remove Programs dialog in the Control Panel, and click Change/Remove. For more information, refer to the online AutoCAD MEP installation guides.

If you installed a shortcut for the Global profile, double-click the shortcut to launch AutoCAD MEP with the Global profile set as current.


Lesson 1: Starting a Drawing

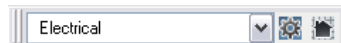
In this lesson, you learn how to configure a project and use the Project Navigator to start a drawing. You also learn how to reference a floor plan drawing in a current drawing.

Exercise 1: Specifying a Project

First, you specify a project using the Project Browser. After you specify the current project, you use the Project Navigator to create directories for the AutoCAD MEP drawings.

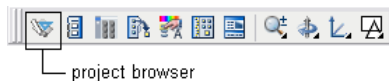
Specify the current project

- 1 If you do not have a drawing open, click  on the Standard toolbar to create a drawing.
- 2 On the Workspaces toolbar, select Electrical.



- 3 Open the Project Browser using one of the following methods:

- Click Project Browser on the Navigation toolbar.

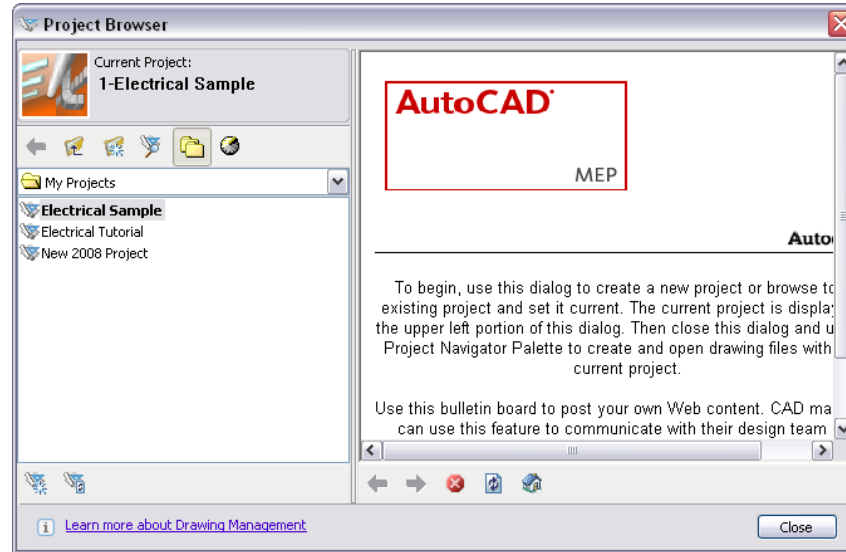


- Click File menu ► Project Browser.

- 4 In the lower-left corner of the Project Browser, click  (New Project).

- 5 In the Add Project dialog, enter 1 for Project Number, enter Electrical Sample for Project Name, and click OK.

In the Project Browser, the new project is highlighted to indicate that it is the current project. The right pane contains an HTML page. To facilitate sharing project information, you can create and store HTML pages in the project location.



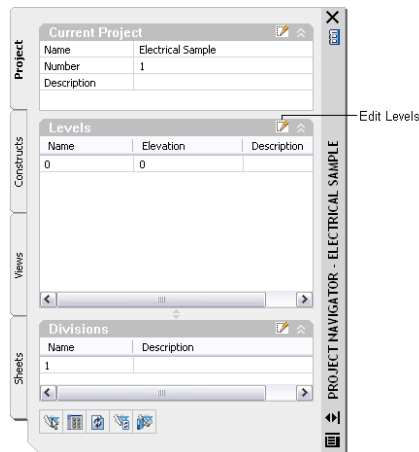
6 Click Close.


The Project Browser is closed, but the project is still active until you change to another project. When you start AutoCAD MEP, the current project is the last one specified before the software was closed.

Use the Project Navigator

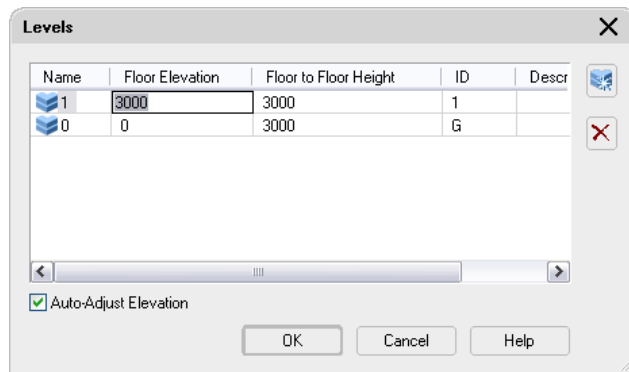
The Project tab on the Project Navigator displays general project information and lists levels and divisions.

7 On the Project tab, click the Edit Levels icon to add a level.



8 In the Levels dialog, click  (Add Level).

To edit values, such as floor elevation or height, you click in the field, and enter the desired value.



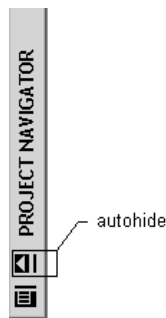
You assign construct drawings to floors, and then use those floor assignments when creating view drawings.

9 Click OK.

10 Review the other tabs on the Project Navigator, which are used to manage different types of drawings:

- **Constructs** are drawings that model a unique portion of a building system. For example, an electrical plan for one floor can be a construct. You create constructs of building plans, and then you reference them onto views and sheets to create construction documents. Because the views reference the constructs, and the sheets reference the views, you only need to modify the construct drawings. Views and sheets are updated automatically when you open them, or when you manually regenerate a view.
- **Views** comprise one or more constructs that show a specific view of a building. For example, you can create a view of an electrical plan for an entire floor. You can create general views, detail views, and section/elevation views.
- **Sheets** are construction documents or presentation documents that contain fully-annotated views and details. They are generally plotted or published to DWF™.

11 To minimize the Project Navigator automatically to make more room for drawing space, click Autohide.



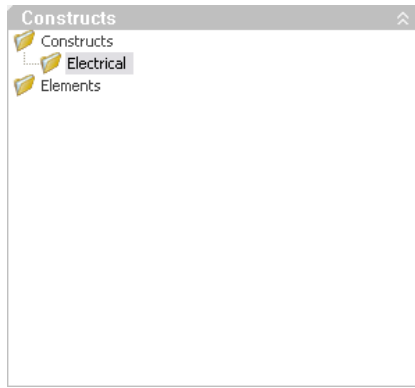
When you move the cursor off the Project Navigator, the Project Navigator minimizes so that just the title bar is visible. To open it, move the cursor over the title bar.

Create an electrical constructs directory

12 Click the Constructs tab.

13 Select the Constructs directory, right-click, and select New ► Category.

- 14 Change the name of the new category to Electrical.



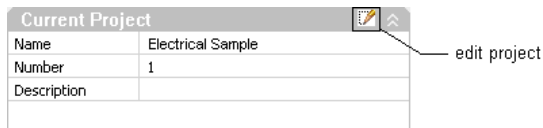
In this exercise, you learned how to create a project and use the Project Navigator to specify floor levels. You also created a new construct category.

Exercise 2: Specifying a Template

A drawing template contains information such as layer key styles, object style definitions, system definitions, and display settings. Template files are specified in the project settings.

View the default template for the project

- 1 Click the Project tab in the Project Navigator.
- 2 In the Current Project heading, click the Edit Project icon.



- 3 In the Modify Project dialog, scroll to Default Construct Template.
- 4 Move the cursor over the field next to Default Construct Template.
A tooltip displays the complete file path of the default template for new construct drawings.
- 5 Click OK.

Create a new construct drawing

- 6 In the Project Navigator, click the Constructs tab.
- 7 Under Constructs, select Electrical.
- 8 Right-click, and select New ► Construct.
- 9 In the Add Construct dialog, click in the field for Name, and enter Electrical Sample.
- 10 Move the cursor over the Drawing Template field to view the full file path.
This is the default template specified in the project settings.

- 11 Select Level 0 to assign the construct to the ground floor.

Name	Electrical Sample
Description	
Category	Constructs\Electrical
Drawing Template	C:\Documents and Settings\Aecb Model (Global Ctb).dwt
File Name	Electrical Sample

Assignments

Level	Description
1	<input type="checkbox"/>
0	<input checked="" type="checkbox"/>

OK Cancel Help

- 12 Click OK.

The new construct drawing is added to the Electrical category under Constructs. When you create a new construct drawing, it is not automatically opened in the software. You can open a new drawing from the Project Navigator by double-clicking the drawing name.

TIP In addition to creating a new drawing from the Constructs tab, you can also add an existing drawing to a project. Open the drawing, right-click the construct category where you want to place it, and click Save Current Dwg as Construct.

In this exercise, you learned how to use a template to create a new construct drawing.

Exercise 3:Viewing Configuration Settings

In the Project Navigator, you viewed project settings such as building levels, elevations, and templates. In this exercise, you view other important configuration settings, such as preferences and system definitions. These settings control how your electrical systems look and function in the drawing.

Open a new construct drawing

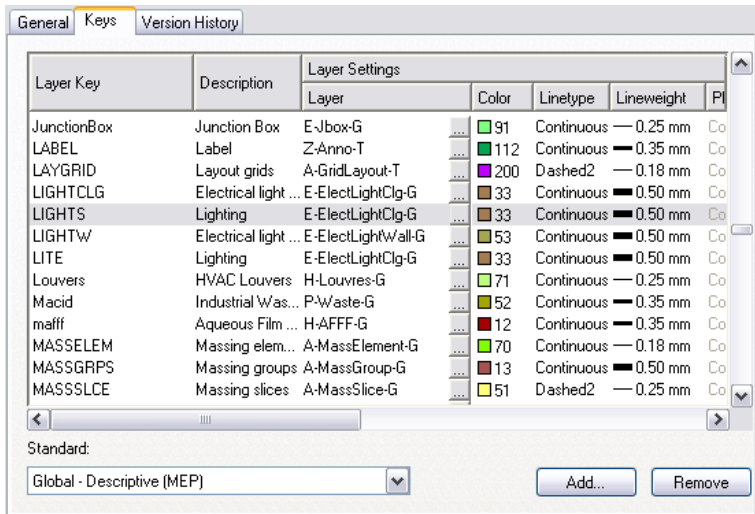
- 1 In the Project Navigator, on the Constructs tab, expand Electrical.
- 2 Double-click Electrical Sample to open it.

Next, you view layer key settings for objects. Layer keys are used to add layers automatically as you draw electrical systems. You do not need to create layers as you draw.

View layer key settings

- 3 Click Format menu ► Layer Management ► Layer Key Styles.
- 4 In the left pane of Style Manager, click Global - Descriptive (256 Colors) (MEP).
- 5 In the right pane, click the Keys tab.

6 Scroll to the layer key LIGHTS.



The layer specified is E-ElectLightClg-G.

The template you specified for this drawing, Aecb Model (Global), uses a layer key system based on a custom, descriptive layer standard. Using that layer standard, the first part of the layer name indicates the discipline, the second part indicates the element, and the last part indicates the data type. For the E-ElectLightClg-G layer name, the E indicates electrical, ElectLightClg indicates the part, and G indicates the data type is graphics. Because the layer standard is descriptive, the element is described rather than assigned a code.

Layer keys are configured for parts and systems. When you add a part, you specify a system for it before placing it in the drawing. The layer on which the part is placed is based on the layer keys for the part type and system definition.

For example, you draw an electrical lighting system that consists of lights, switches, and wires. You specify the 230V Lighting Devices (Ceiling) system for each component. The lights are automatically placed on the E-ElectLightClg-G layer, where ElectLightClg indicates the ceiling light system.

TIP Layer keying allows you to efficiently manage layers in your drawing. For example, you can use filters in the Layer Manager to turn off a layer for a specific system, or use filters to turn off specific objects on the layer.

7 Click Cancel.

Next, you view system definitions. These settings control the appearance and function of parts in a system.

View electrical system definitions

8 Click Electrical menu ► Electrical Settings ► Electrical System Definitions.

9 In the left pane of Style Manager, click 230V Lighting.

10 In the right pane, click the Design Rules tab.

Note the layer key. When you assign a system to a component, this setting determines its layer and other layer settings, such as color and linetype.

11 Click the Rise and Drop tab.

This tab specifies the rise and drop style to use to display vertical directions in the system.

12 Click the Display Properties tab.

This tab specifies general display settings for the system components. You can use it to override the display properties for objects. For example, you can turn off contour lines for conduit, or add a hatching pattern to visually enhance a particular conduit in the drawing.

13 Click Cancel.

Next, you view demand factor definitions.

View demand factors

14 Click Electrical menu ► Electrical Settings ► Demand Factor Definitions.

15 In the left pane of Style Manager, click Lighting - Dwelling Units - Above 120kVA.

16 In the right pane, click the Demand Factor tab.

The demand factor value can be assigned to a circuit and used to calculate load. The template includes several demand factor definitions for lighting and receptacle loads in different building types. You can copy and modify demand factor definitions to meet your project requirements.

17 Click Cancel.

Next, you view electrical settings that are applied to all electrical systems as you draw them.

View electrical preferences

18 Click Electrical menu ► Electrical Settings ► Electrical Preferences.

19 Click the Voltage Definitions tab.

This tab contains the voltage settings for 1-pole, 2-pole, and 3-pole systems.

20 Click the Circuiting tab.

This tab specifies settings for circuit naming and load checking. You can also specify the ambient temperature to use for wire size calculations.

21 Click Cancel.

The last settings you view are for cable tray and conduit.

View cable tray and conduit preferences

22 Click Electrical menu ► Cable Trays ► Preferences.

23 Click the Routing tab.

When you draw cable tray runs, these settings control layout behavior.

24 Click the Annotation tab.

You can use these settings to automatically add labels, such as size, to cable tray segments as you draw them.

25 Click the Parts tab.

These settings are important because they specify which parts are automatically inserted during layout. For example, if you specify a right angle in your layout geometry, the elbow specified here is inserted into your cable tray run.

You can change these default parts at any time. You can specify any part that is included in the current cable tray parts catalog.

26 Click the Connections tab.

These settings control how new cable tray runs connect with existing cable tray objects. For example, if you connect a new run to an existing elbow, the elbow is automatically converted into a tee.

27 Click Cancel.

28 Click Electrical menu ► Conduits ► Preferences.

The conduit layout preferences are very similar to those for cable tray.

29 Review the layout preferences for conduit, and click Cancel.

Exercise 4: Inserting a Referenced Drawing

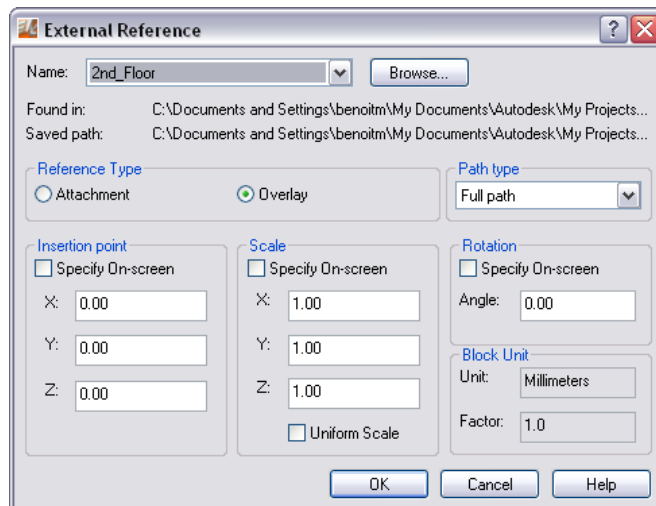
In this exercise, you insert a floor plan as a referenced drawing. Referenced drawings are also referred to as xrefs (or external references) in the software.


Add a referenced drawing

- 1 Verify that Electrical Sample is the current drawing. If not, double-click it on the Constructs tab of Project Navigator.
- 2 Click Insert menu ► DWG Reference.
- 3 In the Select Reference File dialog, browse to My Documents\Autodesk\My Projects\Electrical Tutorial\Constructs\Architectural.

The Windows default location for My Documents is C:\Documents and Settings\<user name>\My Documents.
- 4 Select 2nd Floor, and click Open.
- 5 In the External Reference dialog, specify the following settings:
 - For Reference Type, click Overlay.
 - For Insertion point, clear Specify Onscreen, and verify that X, Y, and Z are 0.
 - For Path type, select Full path.

TIP If offices in different locations are working on the same project, you might want to specify Relative path for Path type.



- 6 Click OK.
- 7 On the Navigation toolbar, click  (Zoom Extents).

The floor plan displays in the drawing window. All of the architectural elements in the xref floor plan drawing are automatically screened as gray.



When you add an xref drawing, you can attach it or overlay it. For construct drawings, overlays are recommended. If you attach a drawing as an xref, you add all of the reference drawing data to the current drawing. An overlay does not add its drawing data to the current drawing, thus it can help minimize file sizes. However, for view drawings, it is recommended that you attach xrefs if you want the reference drawing geometry to display on the sheet.

It is recommended that you use 0,0,0 for the X,Y,Z insertion coordinates. As you develop construct drawings based on this floor plan, you can add them as xrefs in views and in other constructs by inserting them at 0,0,0. This maintains accurate locations for each subsequent system designed for the floor plan.

NOTE When you are working with a Drawing Management project, add an xref by dragging it from the Constructs tab of the Project Navigator onto the current drawing. Xrefs that are not added in this way are lost when the project is refreshed. When you add an xref by dragging it from the Project Navigator onto a drawing, it is attached instead of overlaid, referenced using its full file path, and placed at the X,Y coordinates of 0,0. Its elevation (Z coordinate value) is also updated to a value relative to the host drawing, and it is determined using the elevations of the levels to which the 2 drawings are assigned.

Clip the referenced drawing

In the next lesson, you add lighting systems to the west side of the building. You will now clip the referenced drawing to display only the west side in the drawing. This makes it easier to work on this specific portion of the building.

- 8 Select the floor plan by moving the cursor over any linework, and click.

The floor plan is highlighted.

- 9 Right-click, and select Clip Xref.

- 10 On the command line, enter **n** for New boundary.

- 11 Enter **r** to define a rectangular boundary.

- 12 Click outside the lower-left corner of the building to specify the first point of the rectangular boundary.

- 13 Move the cursor to the second point as shown, and click to specify the opposite corner.



The west side of the floor plan is visible, and the east side has been clipped from view.



- 14 On the Navigation toolbar, click  (Zoom Extents).

- 15 Close the current drawing, and click No when prompted to save the drawing.

In this lesson, you created a new drawing based on a template. You also viewed electrical settings that affect the construction and the appearance of the electrical systems. You also added a reference to an architectural floor plan drawing, and you clipped it so that you could focus on the portion of the drawing in which you will be working.

Next, you add an electrical panel to the floor plan, and you draw a lighting plan.

Drawing a Lighting Plan

2

The exercises in this lesson offer instructions on how to create a lighting plan using AutoCAD MEP.

Lesson 2: Lighting for Lab 247

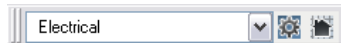
In this lesson, you learn how to add devices such as lights, switches, and junction boxes. You also learn different ways to tag lights for scheduling, and you learn how to add wire runs. You create a panel, and configure a project database that can be used to manage circuits for multiple drawings. You use Circuit Manager to calculate wire sizes.

Exercise 1: Adding Panels and Circuits

In this exercise, you add a panel to a drawing, and you configure circuits for the panel. This drawing is to be used as the project database. The project database controls the circuit configuration for a project. You can assign multiple drawings to a single project database drawing.

Specify the tutorial project

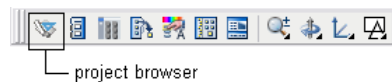
- 1 On the Workspaces toolbar, verify that Electrical is the current workspace.



When the Electrical workspace is active, the Electrical menu is available on the menu bar, and the Electrical tool palettes group is opened.

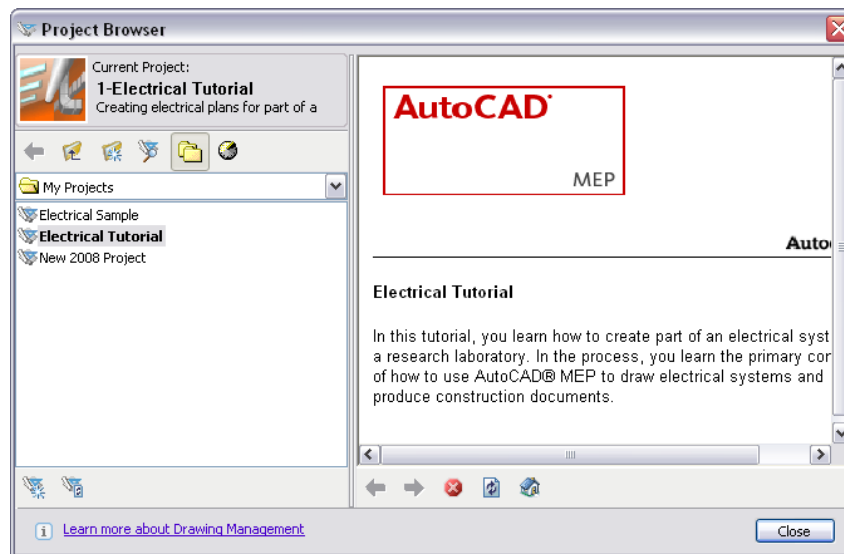
- 2 Open the Project Browser using one of the following methods:

- Click Project Browser in the Navigation toolbar.



- Click File menu ► Project Browser.

- 3 In the Project Browser, double-click Electrical Tutorial to specify it as the current project.




If the Electrical tutorial is not displayed, browse to My Documents\Autodesk\My Projects. The Windows default location for My Documents is C:\Documents and Settings\<user name>\My Documents. If the tutorial project is not in this location, it might not have been extracted. See [“Extracting the Project Datasets”](#) on page 2.

If you are prompted to re-path the project files, click Yes.

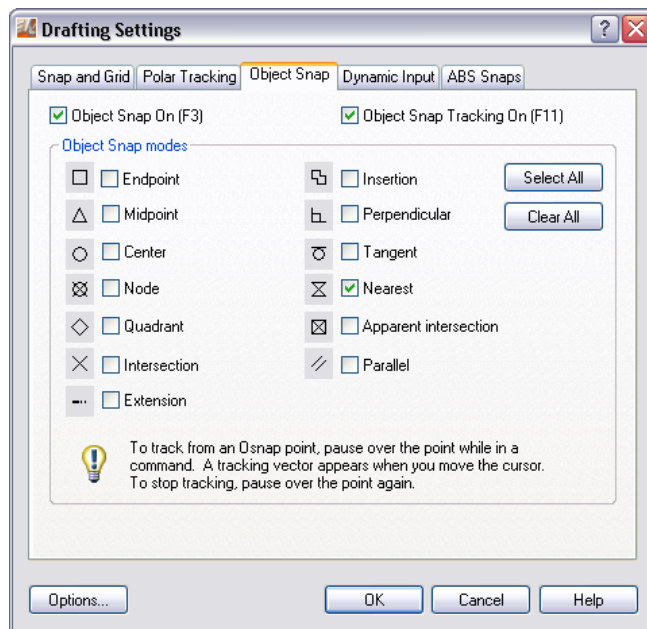
- 4 Click Close.

Open the dataset drawing

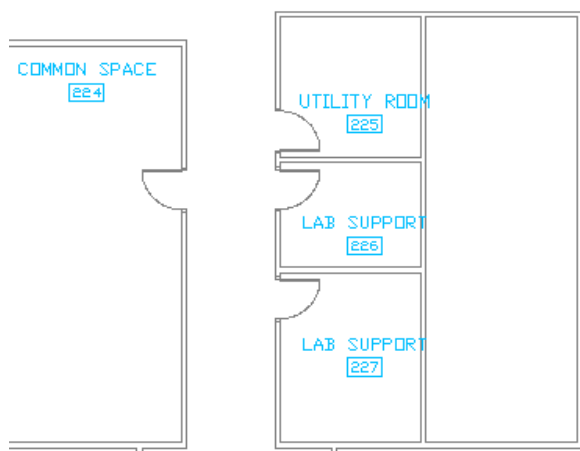
- 5 In the Project Navigator, click the Constructs tab.
- 6 Expand Lesson 2.
- 7 Double-click Electrical_L02_E01 to open the construct drawing.
- 8 On the Navigation toolbar, click  (Zoom Extents).

Add a panel

- 9 On the application status bar, select ORTHO, OSNAP, and DYN.
- 10 Right-click OSNAP, and click Settings.
- 11 On the Drafting Settings dialog, click the Object Snap tab.
- 12 Click Clear All, then select Nearest.



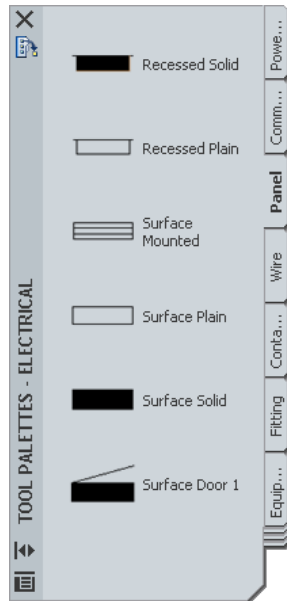
- 13 Click OK.
- 14 Pan and zoom to Utility Room 225.



NOTE An efficient way to pan and zoom in a drawing is to use the scroll wheel on the mouse. Turn the wheel to zoom in or out, hold it down and drag to pan, or double-click it to zoom extents. You can use these features while a command is active.

15 On the Electrical tool palettes group, open the Panel tool palette.

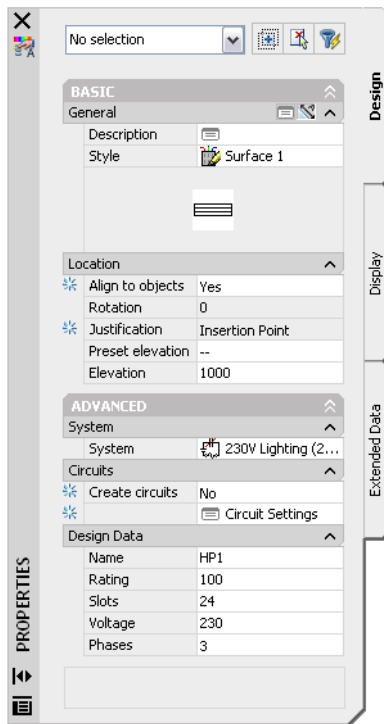
16 Click the Surface Mounted tool.



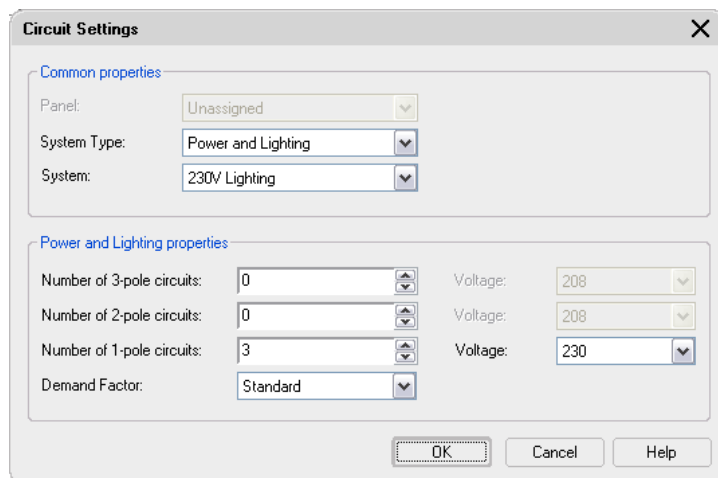
17 On the Design tab of the Properties palette, specify the following settings for the HP1 panel:

- Expand General, and for Style, select Surface 1.
- Expand Location, and for Align to objects, select Yes.
- For Elevation, enter 1000.
- Expand Advanced, and for System, 230V Lighting (230V LIGHTING).
- Expand Design Data, and for Name, enter HP1.
- For Rating, enter 100.
- For Slots, enter 24.
- For Voltage, enter 230.

- For Phases, enter 3.

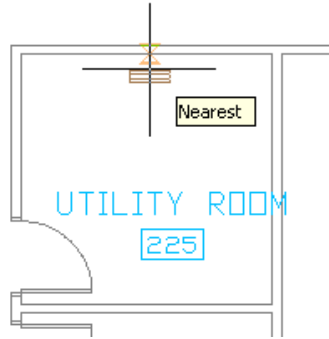


- 18 Still on the Properties palette, expand Advanced ► Circuits.
- 19 For Create Circuits, specify Yes, and click Circuit Settings directly beneath it.
- 20 In the Circuit Settings dialog, specify the following settings:
 - For System Type, select Power and Lighting.
 - For System, 230V Lighting.
 - For Number of 3-pole circuits, enter 0.
 - For Number of 2-pole circuits, enter 0.
 - For Number of 1-pole circuits, enter 3.
 - For Voltage (for 1-pole circuits), enter 230.
 - For Demand Factor, select Standard.



- 21 Click OK.

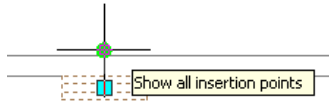
- 22** Move the cursor to the wall as shown, and click the Nearest snap to snap to the nearest drawing geometry, which in this case is the wall. The panel automatically aligns to the wall.



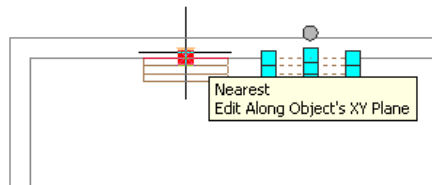
- 23** Press Enter to end the command.

Next, you learn how to move the panel along the wall to refine its location.

- 24** Select the panel, and click the Show all insertion points grip.

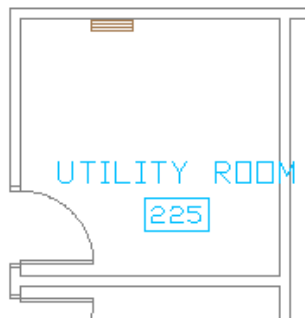


- 25** Click the top middle grip as shown, and move the panel directly to the left along the wall. The Nearest snap should be active.



- 26** Enter 600, and press Enter. The panel is moved 600 mm to the left.

- 27** Press Esc to deselect the panel.



TIP You can use the insertion points on the panel, objects snaps, and dynamic dimensioning input to place panels precisely.

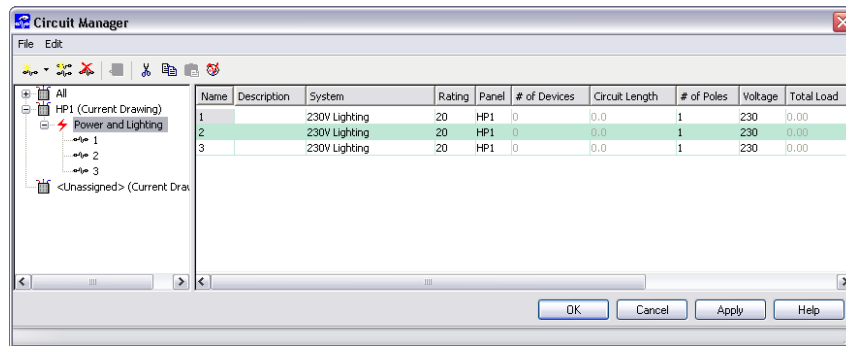
Configure circuits

Next, you configure 3 circuits for the lighting plan.

28 Click Electrical menu ► Circuits ► Circuit Manager.

29 In the left pane of Circuit Manager, expand HP1 (Current Drawing), and select Power and Lighting.

Note the 3 circuits created when you added the panel. You can add more circuits to a panel at anytime using Circuit Manager.



30 For circuit 1, double-click in the Description field, and enter Lab 247 Fluorescent.

Name	Description	System	Rating	Panel	# of Devices	Circuit Length	# of Poles	Voltage
1	Lab 247 Fluorescent	230V Lighting	20	HP1	0	0.0	1	230
2	230V Lighting	230V Lighting	20	HP1	0	0.0	1	230
3	230V Lighting	230V Lighting	20	HP1	0	0.0	1	230

31 Repeat the previous steps 2 more times for circuits 2 and 3.

- For the description for circuit 2, enter Lab 247 Can Lights.
- For the description for circuit 3, enter Lab Support Fluorescent.

Name	Description	System	Rating	Panel	# of Devices	Circuit Length	# of Poles	Voltage
1	Lab 247 Fluorescent	230V Lighting	20	HP1	0	0.0	1	230
2	Lab 247 Can Lights	230V Lighting	20	HP1	0	0.0	1	230
3	Lab Support Fluorescent	230V Lighting	20	HP1	0	0.0	1	230

32 Click OK.

33 On the File menu, click Close, and click No when prompted to save the drawing.

In this exercise, you learned how to add panels and configure circuits.


Exercise 2: Adding Lights

In this exercise, you add lights to Lab 247. You reference the project database drawing that contains the panel and circuits. By using the project database, you will be able to share circuit information across all project drawings.

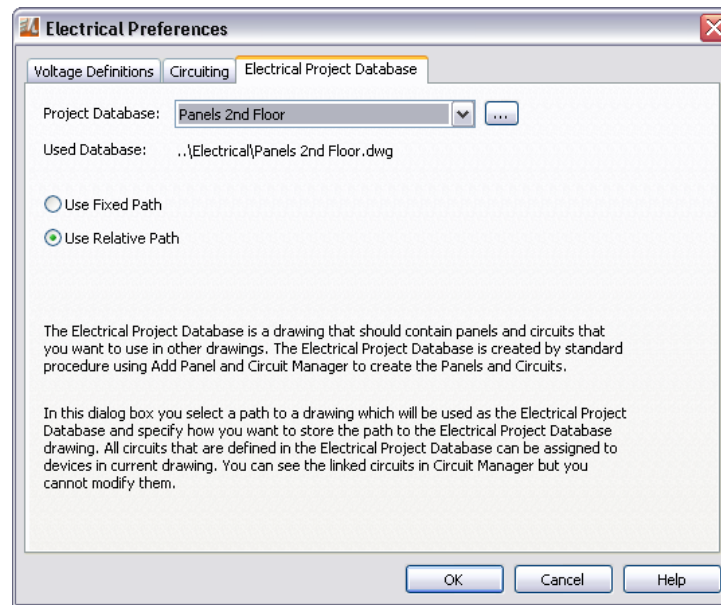
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L02_E02 under Constructs ► Lesson 2.

Specify a project database

- 1 Click Electrical menu ► Electrical Settings ► Electrical Preferences.
- 2 In the Electrical Preferences dialog, click the Electrical Project Database tab.
- 3 Click  (Browse) beside the Project Database drop-down list.
- 4 Browse to My Documents\Autodesk\My Projects\Electrical Tutorial\Constructs\Electrical.
- 5 Select Panels 2nd Floor.dwg, and click Open. (This drawing is the same as the one created in the first exercise.)

Panels 2nd Floor is specified for Project Database.



6 Select Use Relative Path.

7 Click OK.

Add a pendant fluorescent light


8 Pan and zoom to the right side of Lab 247.

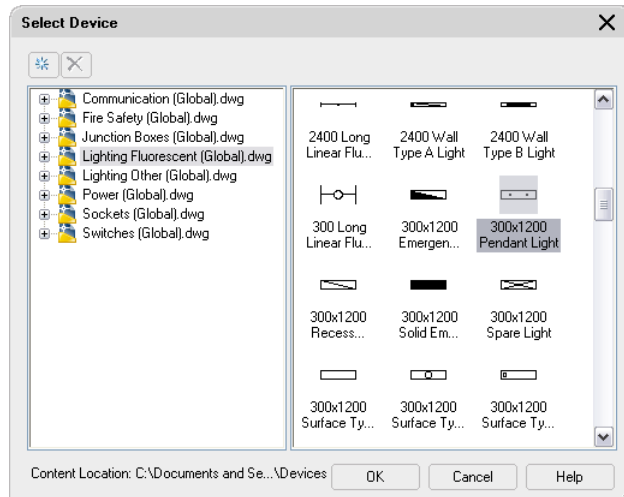
9 On the application status bar, select ORTHO.

10 Enter **deviceadd**.

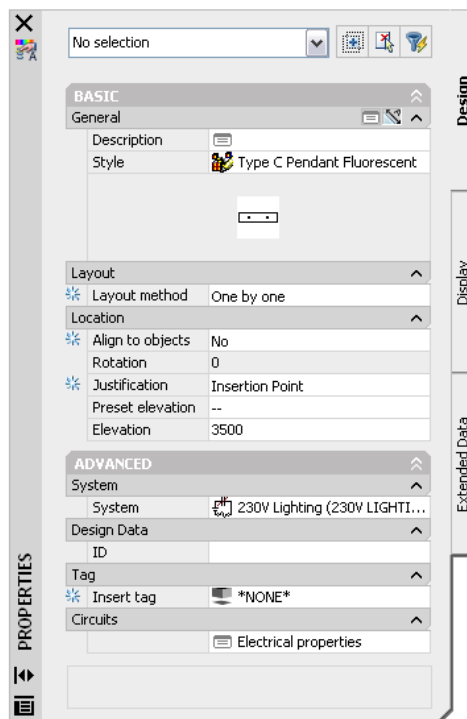
NOTE You can also start the DEVICEADD command by selecting a preconfigured device tool on one of the tool palettes. In this case, you enter the command instead of using a tool because you will select a device style stored in the drawing that is not used by any of the tools. The device style (Type C Pendant Fluorescent) is configured with a load of 96 VA per fixture. Configuring a device style to include a load alleviates the need to enter a load each time you add a device.

11 On the Properties palette, expand General, and for Style, select Type C Pendant Fluorescent. The list of choices includes all of the styles in the current drawing.)

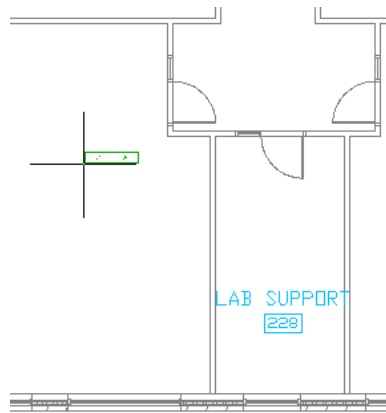
NOTE As you create electrical drawings, you can also select from the styles stored in the style-based content folders, which you specify on the MEP Catalogs tab of the Options dialog. To select from these styles, you click the worksheet icon () on the General category bar on the Properties palette, and then you select a device in the Select Device worksheet.



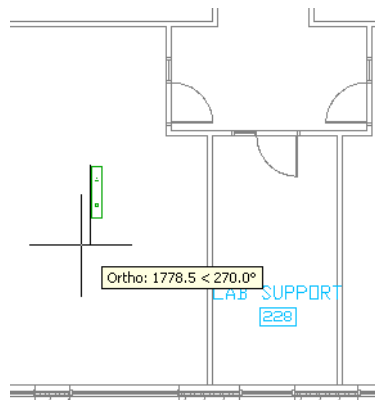
- 12 Expand Layout, and for Layout method, select One by one.
- 13 Expand Location, and for Align to objects, select No.
- 14 For Elevation, enter 3500.
- 15 Expand Advanced, and for System, select 230V Lighting (230V LIGHTING).



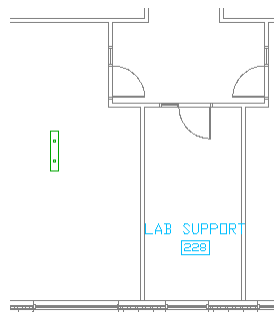
16 In the drawing, specify the insertion point in the approximate location shown.



17 Move the cursor to rotate the light as shown, and click to insert the light.



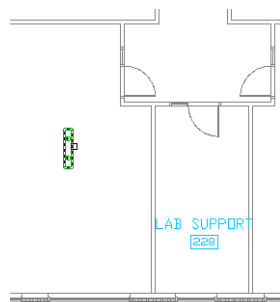
18 Press Enter to end the command.



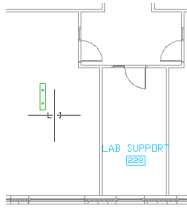
Add a tag to the light

19 Open the Tag and Schedule tool palette, and select the Lighting Device - Text tool.

20 Select the light.

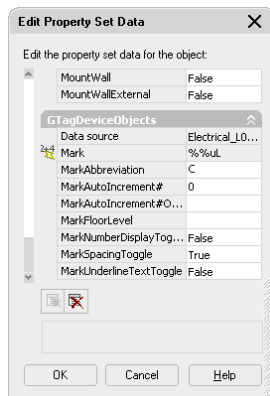


21 Specify the insertion point for the tag as shown.



22 In the Edit Property Set Data dialog, scroll to GTagDeviceObjects.

23 For MarkAbbreviation, enter C, and for MarkUnderlineTextToggle, select False.



24 Click OK, and press Enter to end the command.



Array the light

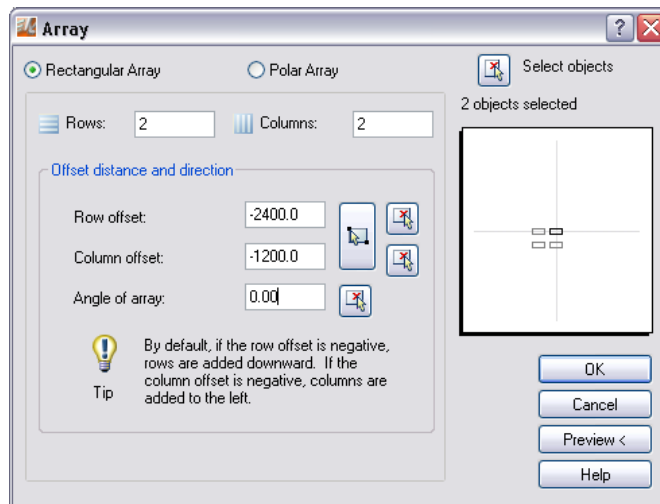
25 Select the light and its tag.

26 Right-click, and click Basic Modify Tools ► Array.

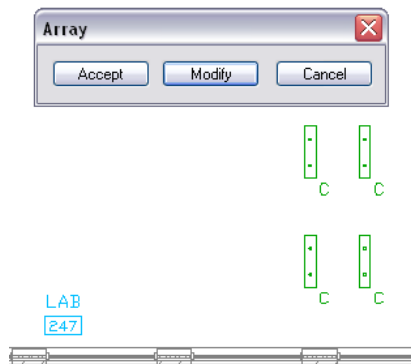
27 In the Array dialog, specify the following settings:

- Select Rectangular Array.
- For Rows, enter 2.
- For Columns, enter 2.
- For Row Offset, enter -2400.

- For Column Offset, enter -1200.



- 28 Click Preview.
- 29 Preview the array, and click Accept.

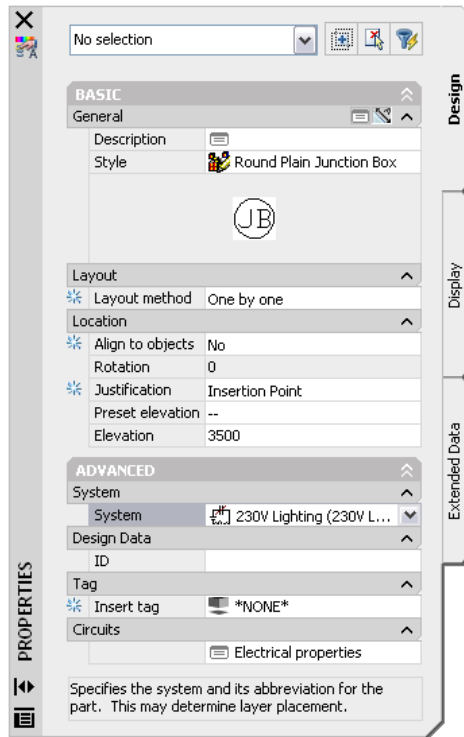


Add a junction box

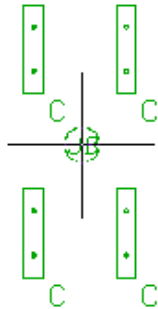
- 30 On the Power-Lighting Device tool palette, select any junction box tool.
- 31 On the Properties palette, click the Select Device icon on the General category bar.
- 32 In the right pane of the Select Device worksheet, select Round Plain Junction Box, and click OK.

NOTE The style-based junction boxes available on the worksheet (and on the Power-Lighting Device tool palette) are different than the junction box available on the Equipment tool palette. They display symbolically and connect to wires. The equipment junction box is an MvPart, displays as scaled to its actual dimensions, and connects to conduit.

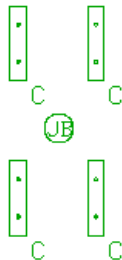
33 On the Properties palette, specify the settings as shown.



34 Specify the insertion point approximately in the center of the light cluster as shown.



35 On the command line, enter 0 for rotation, and press Enter twice.



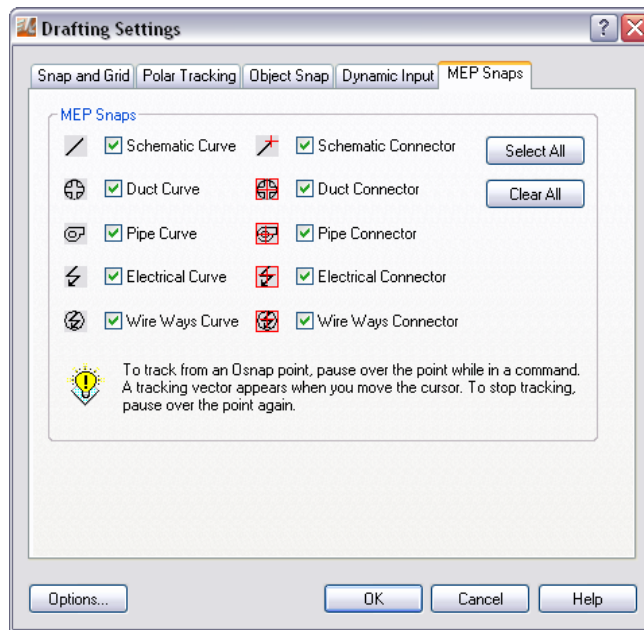
Wire the junction box to the lights

36 Deselect ORTHO.

37 Right-click OSNAP, and click Settings.

38 In the Drafting Settings dialog, click the MEP Snaps tab.

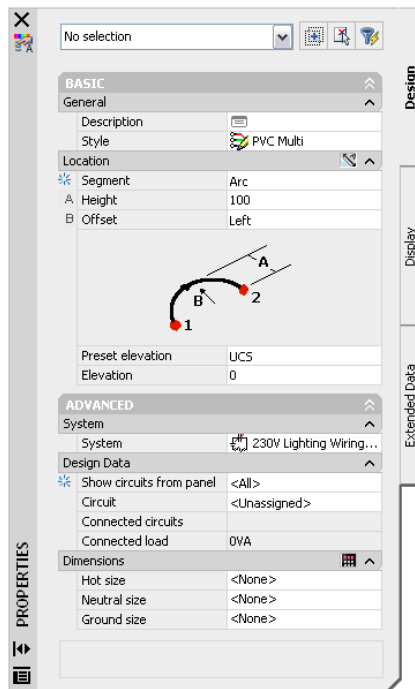
39 Verify that Electrical Curve and Electrical Connector are selected, and click OK.



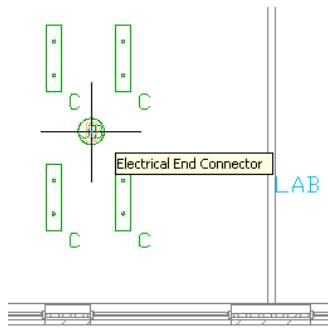
40 Enter **wireadd**.

41 On the Properties palette, specify the settings as shown:

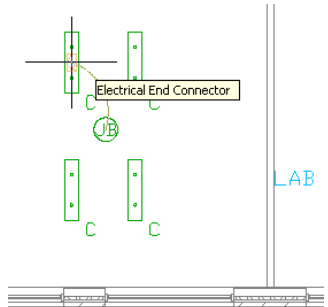
- Expand General, and for Style, select PVC Multi.
- Expand Location, and for Segment, select Arc.
- Expand System, and for System, 230V Lighting Wiring.



42 Move the cursor over the junction box, and click on the electrical end connector.



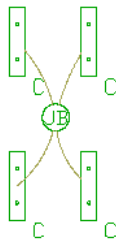
43 Click the electrical end connector on the light to specify the endpoint for the wire.



44 With the command still active, enter **n** for new run.

45 Repeat the 3 previous steps to add wires from the junction box to the other lights.

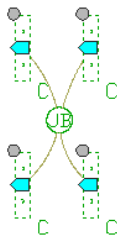
46 After you add the last wire, press Enter twice to end the command and not add a home run wire.



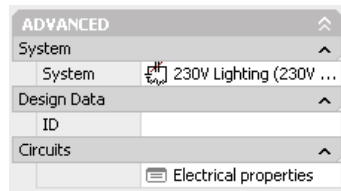
NOTE If the wires are not drawn exactly as shown (and they cross instead), you can select them one by one and modify the layout of each using the Location grips.

Assign the lights to a circuit

47 Select a light, right-click, and click Select Similar. All lights are selected.



48 On the Properties palette, under Advanced ► Circuits, click Electrical Properties.



49 In the Electrical Properties dialog, under Connector Properties, for Show circuits from panel, select HP1 (Project Database) from the drop-down list.

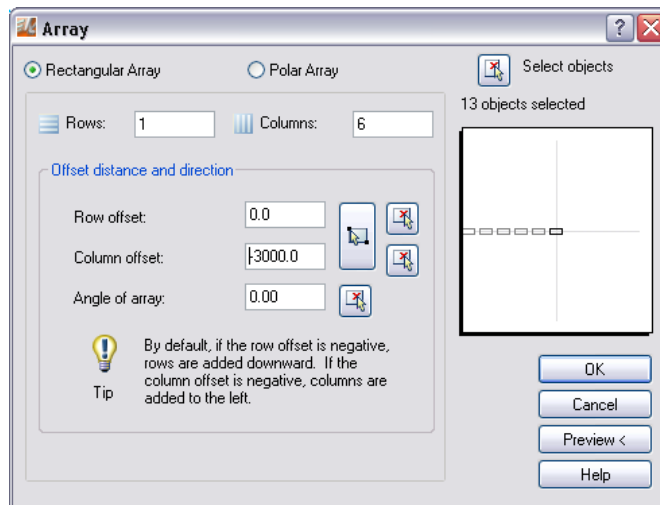
50 For Circuit, select 1 from the drop-down list, and click OK. The 4 lights are assigned to circuit 1.

Add an array of the lights to the rest of the room

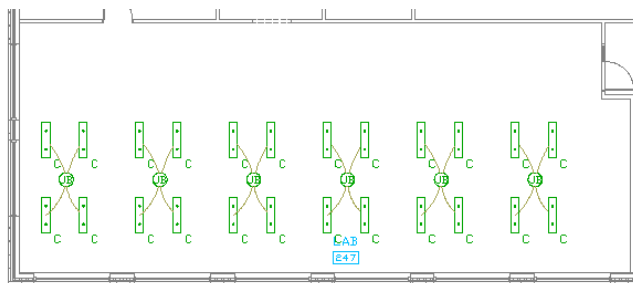
51 Select the lights, tags, junction box, and wires.

52 Right-click, and click Basic Modify Tools ► Array.

53 In the Array dialog, specify the settings as shown.



54 Preview the array, and click Accept.



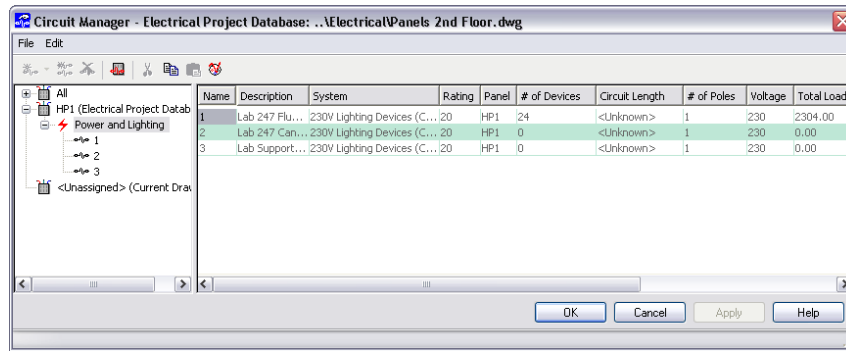
NOTE If you want to refine the location of the lights relative to the floor plan, you can select all of the lights, click Basic Modify Tools ► Move, and move the lights.

Check circuit loads

55 Click Electrical menu ► Circuits ► Circuit Manager.

56 Under HP1, select Power and Lighting.

Note that circuit 1 shows the number of devices assigned to it, and the total load for the circuit is displayed.



57 Click OK.

58 On the File menu, click Close, and click No when prompted to save the drawing.

In this exercise, you added lights, tags, junction boxes, and wires.

Exercise 3: Adding Can Lights

In this exercise, you add incandescent lights to Lab 247. You specify a tag and a circuit when you add the lights.

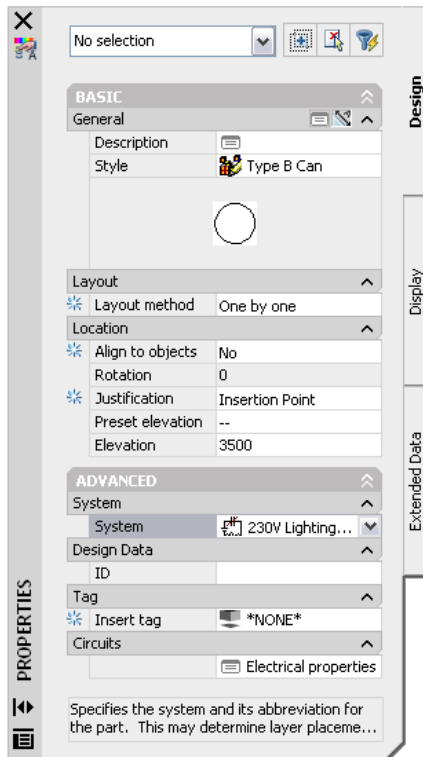
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L02_E03 under Constructs ► Lesson 2.

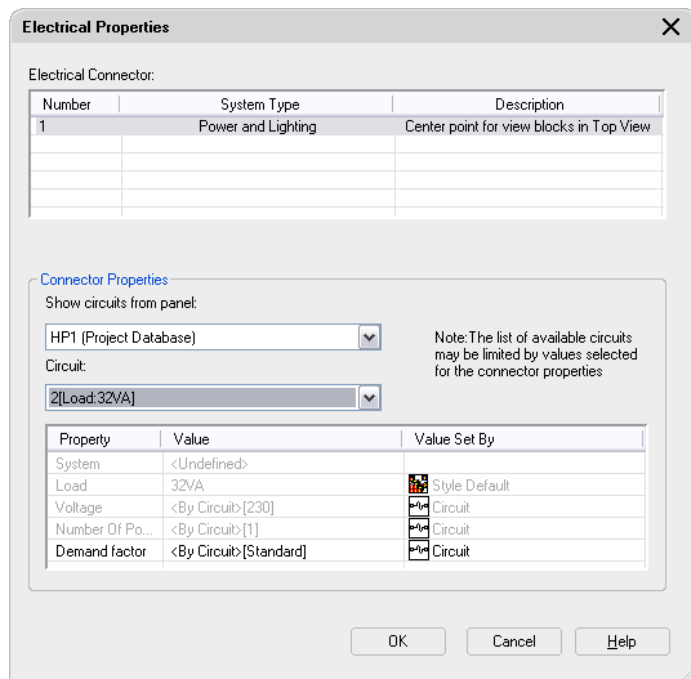
Add the lights

- 1 On the application status bar, select OTRACK, and deselect OSNAP.
- 2 Enter **deviceadd**.
- 3 On the Properties palette, specify the following settings as shown:
 - Expand General, and for Style, select Type B Can. Like the Type A Pendant Light device style, this style has been configured with a load of 32 VA per fixture.
 - Expand Location, and for Elevation, enter 3500.
 - Expand System, and for System, select 230V Lighting.

- Expand Tag, and for Insert tag, select *NONE*.

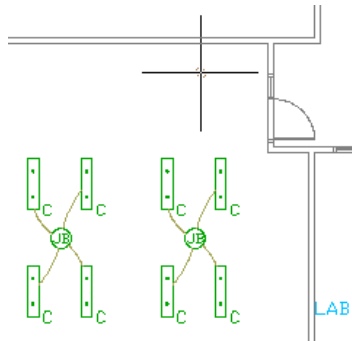


- 4 Click Electrical Properties.
- 5 In the Electrical Properties dialog, for Show circuits from panel, select HP1.
- 6 For Circuit, select circuit 2.



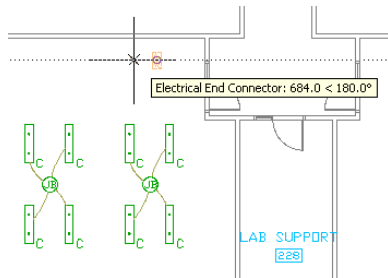
- 7 Click OK.

8 Specify the location for the first can in the approximate location shown.



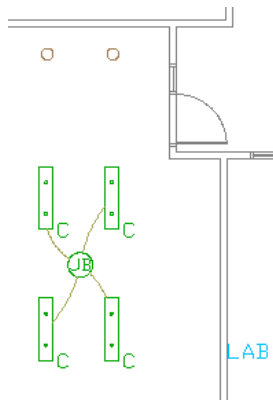
9 Enter 0 for Rotation, and press Enter.

10 With the command still active, move the cursor over the first light, then move it directly to the left to display a tracking line as shown.



11 Enter 1200, and press Enter.

12 Enter 0 for Rotation, and press Enter twice to place the light.



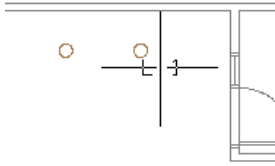
Add tags to the lights

13 Open the Tag and Schedule tool palette, and select the Lighting Device - Text tool.

14 Select one of the lights as shown.



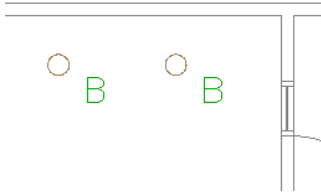
15 Specify the insertion point for the tag as shown.



16 In the Edit Property Set Data dialog, scroll to GTagDeviceObjects.

17 For MarkAbbreviation, enter B, and for MarkUnderlineTextToggle, select False. Click OK.

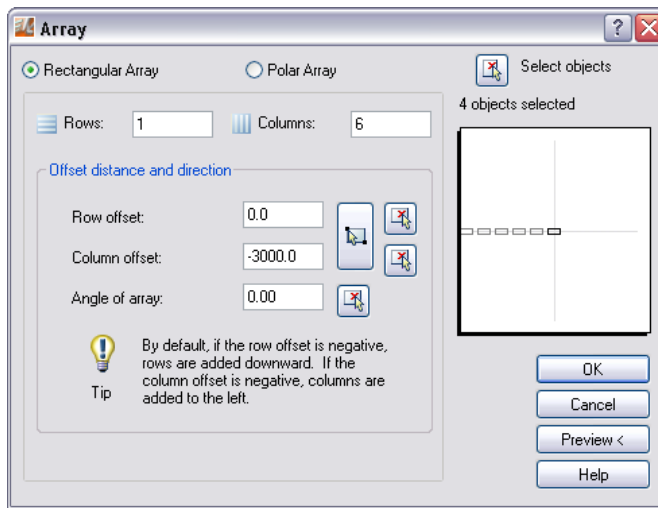
18 Select the other can light, and then repeat the process you just used to add a tag and specify its properties. Press Enter to end the command.



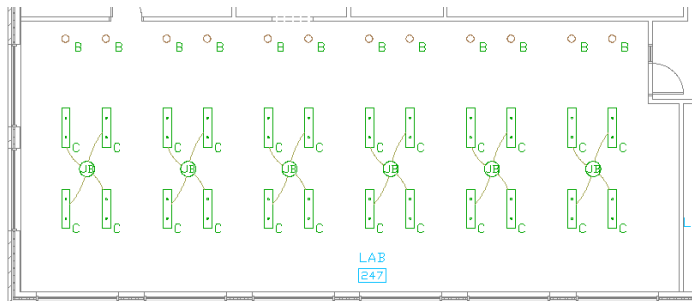
Add an array of can lights

19 Select the 2 can lights and the 2 tags, right-click, and click Basic Modify Tools ► Array.

20 In the Array dialog, specify the settings as shown.



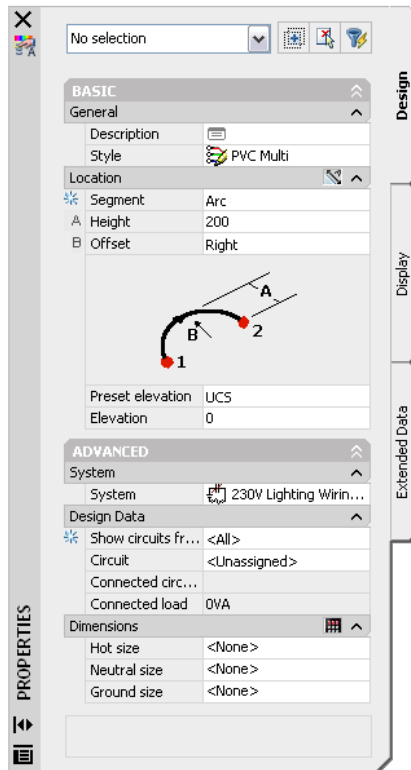
21 Click OK. The can lights are arrayed as shown.



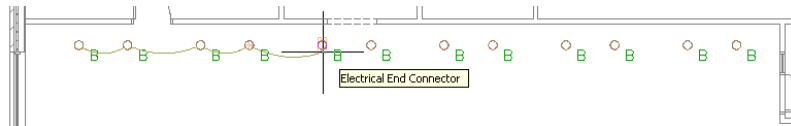
Wire the lights together

22 On the Wire tool palette, select the Wire by System - 230V Lighting Wiring tool.

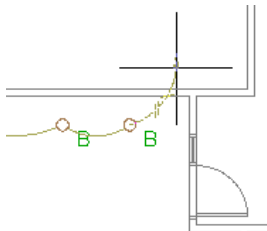
23 On the Design tab of the Properties palette, specify the settings as shown:



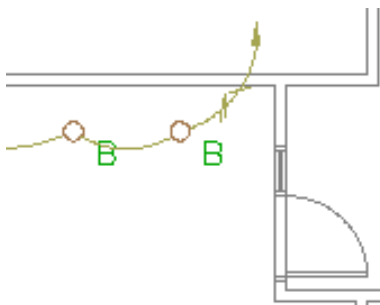
24 Move the cursor over the can on the left end, and click the electrical end snap. Continue selecting lights to add wire.



25 On the last can, press Enter to add a home run.



26 Specify the location for the home run.

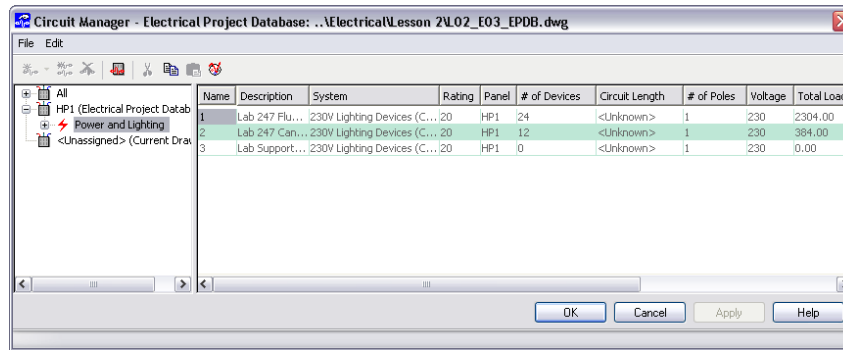


Check Circuit Manager

Next, you open Circuit Manager to view circuit loads.

27 Click Electrical menu ► Circuits ► Circuit Manager.

28 Under HP1, select Power and Lighting.



29 In the right pane, scroll to the right to view the number of devices assigned to each circuit and the total load of the devices.

30 Click OK.

31 On the File menu, click Close, and click No when prompted to save the drawing.

In this exercise, you configured lights to be tagged and assigned to a circuit as you added them to a drawing. You also used Circuit Manager to view circuit information, such as the number of devices and the total load.

Exercise 4: Finishing the Lab 247 Lighting

In this exercise, you finish the lighting plan for Lab 247. You add switches and add labels to the home run wires. You also check connectivity.

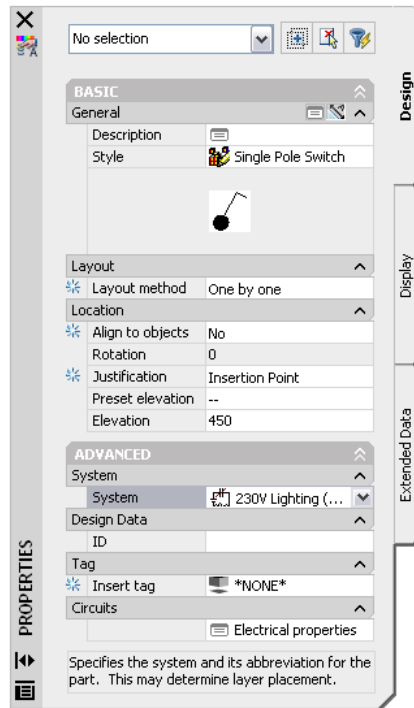
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L02_E04 under Constructs ► Lesson 2.

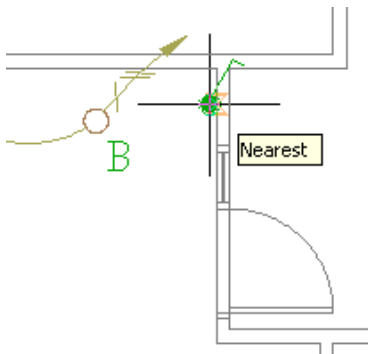
Add switches

- 1 On the application status bar, right-click OSNAP, and click Settings.
- 2 In the Drafting Settings dialog, click the Object Snap tab.
- 3 Select Nearest, and click OK.
- 4 Select OSNAP and ORTHO.
- 5 On the Power-Lighting Device tool palette, select the Switches - Single Pole tool.
- 6 On the Design tab of the Properties palette, specify the settings as shown:
 - Expand Location, and for Elevation, enter 450.

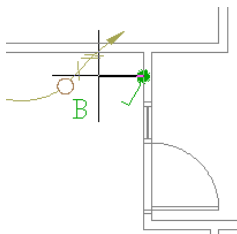
- Expand Tag, and for Insert tag, select *NONE*.



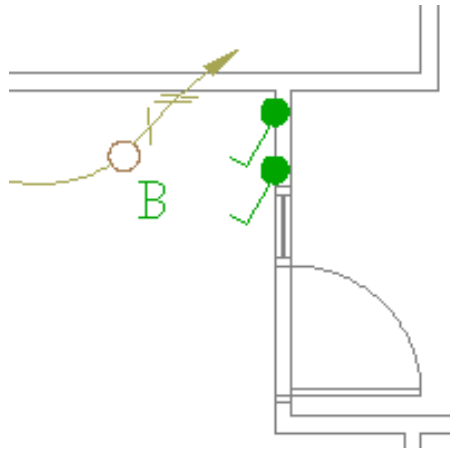
- 7 Specify the insertion point for the switch as shown. Use the Nearest snap to place the switch on the wall.



- 8 Rotate the switch as shown, and click to place it.

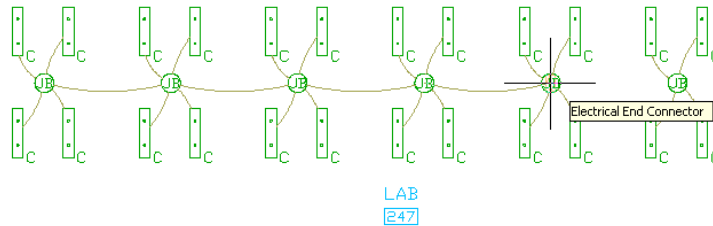


- 9 Use the same steps to add a second switch next to the first one as shown.

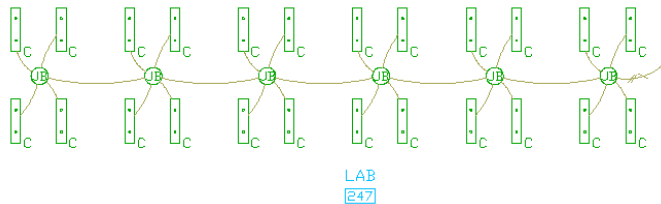


Finish the wiring

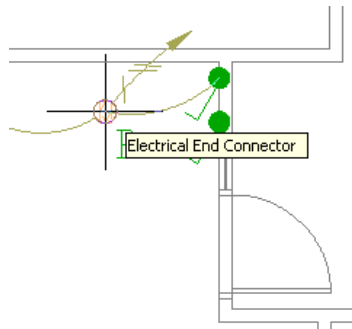
- 10 Deselect ORTHO.
- 11 Select a wire between one of the junction boxes and a pendant light, right-click, and click Add Selected.
The Properties palette is now configured for the same system and style as the selected wire.
- 12 Starting on the left side, add wire to connect the junction boxes as shown.



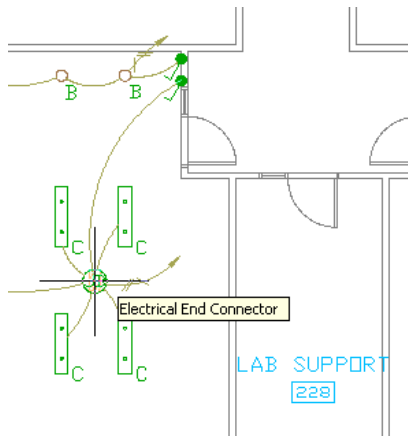
- 13 After you select the last junction box, press Enter to add a home run, and specify the endpoint for the home run.



- 14 Zoom in to the area of the can lights with the home run.
- 15 Select a wire, right-click, and click Add Selected.
- 16 Use electrical snaps to draw a wire from the switch to the can light as shown.



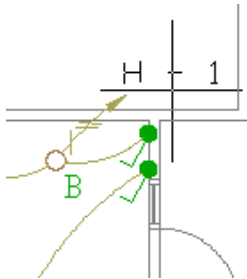
- 17 With the command still active, enter **n** for new run.
- 18 Click the electrical snap on the second switch.
- 19 Click the electrical snap on the junction box to complete the wire segment.



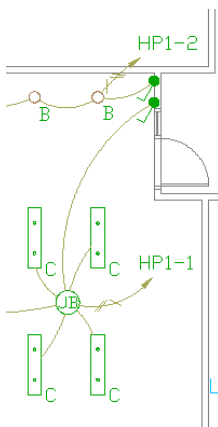
- 20 Press Enter twice.

Add home run tags

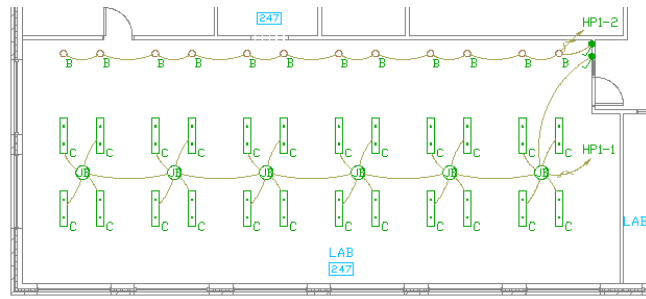
- 21 Open the Annotation tool palette, and select the Home Run Label tool.
- 22 Select the home run on the can lights, and specify an insertion point for the label.



- 23 In the Edit Property Set Data dialog, click OK.
- 24 Repeat the 2 previous steps to add a home run label to the pendant light wiring.



The lighting plan for Lab 247 is complete.

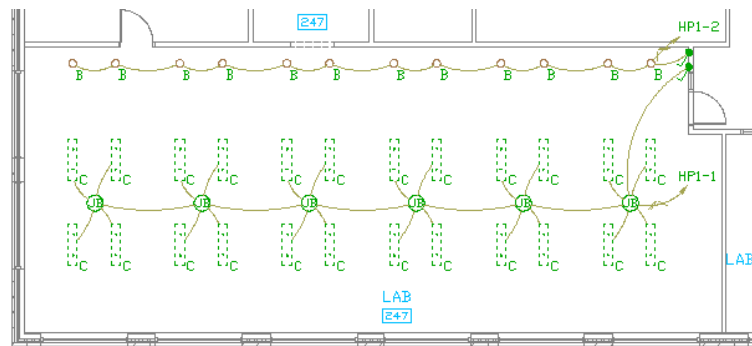


Next, you check connectivity in the systems.

25 Select a wire or device in the pendant light system.

26 Right-click, and click Connected Objects ► Show Circuited Objects.

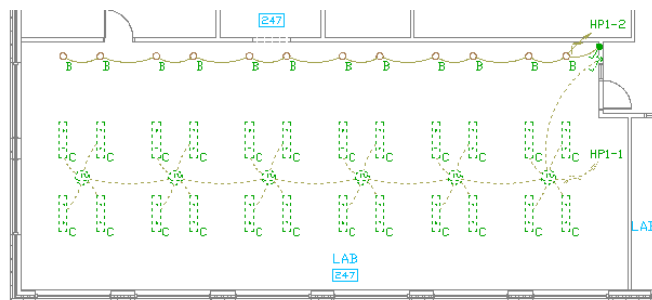
Note that all of the lights are highlighted. These devices are all assigned to the same circuit. The junction boxes and switches are configured with the general system type. Devices of the general system type can connect with other system types, such as power and lighting, and since they typically do not contribute a load to the circuit, they do not need to be assigned to a circuit.



27 Press Esc to deselect the objects.

28 Select the part again, right-click, and click Connected Objects ► Show Connected Run.

This time the entire system is highlighted, including the wiring.



29 Press Enter.

30 Repeat the 5 previous steps to check circuiting and connectivity for the can lights.

31 On the File menu, click Close, and click No when prompted to save the drawing.

In this exercise, you finished the lighting plan by adding wires, home run labels, and switches.

For reference, a completed drawing named Completed_Lab_247_Lighting is included in the Constructs\Lesson 2 directory.

Lesson 3: Lighting for Lab Support

In this lesson, you continue developing the lighting plan by adding lights to the lab support areas.

Exercise 1: Adding Lights

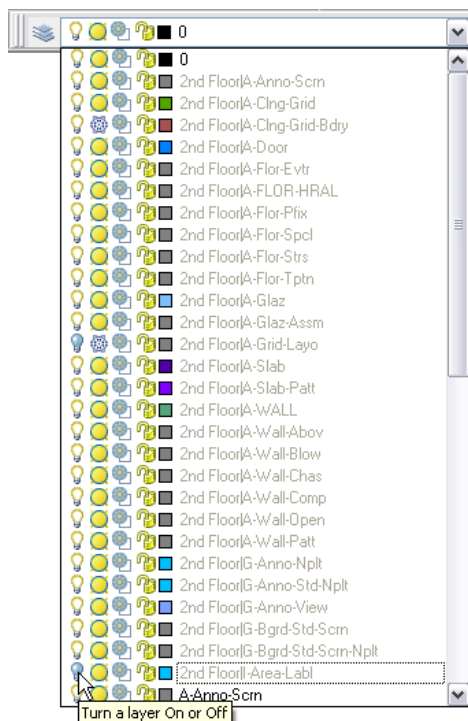
In this exercise, you add recessed fluorescent lights to a ceiling grid.

Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L03_E01 under Constructs ► Lesson 3.

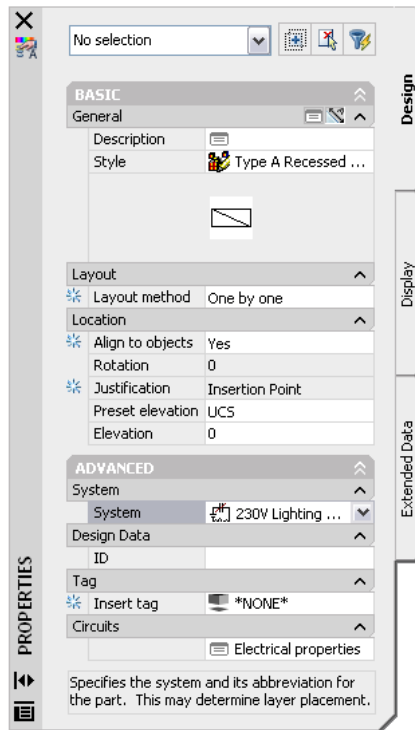
Set up the drawing

- 1 On the application status bar, change the current display configuration to Electrical - Lighting.
- 2 Pan and zoom to Lab Support 221.
- 3 Select OSNAP.
- 4 Right-click OSNAP, and click Settings.
- 5 On the Drafting Settings dialog, click the Object Snap tab.
- 6 Click Clear All, select Node, and click OK.
- 7 In order to improve visibility and object snapping while placing devices in the ceiling grid, turn off the room labels layer: 2nd Floor\I-Area-Labl.

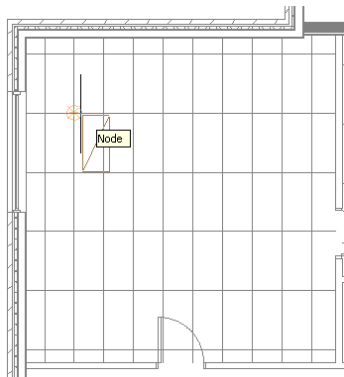


- 8 Enter **deviceadd**.
- 9 In the Properties palette, specify the settings as shown:
 - Expand General, and for Style, select Type A Recessed Fluorescent.
 - Expand Layout, and for Layout method, select One by one.
 - Expand Location, and for Align to objects, select No.
 - Expand System, and for System, select 230V Lighting (230V LIGHTING).

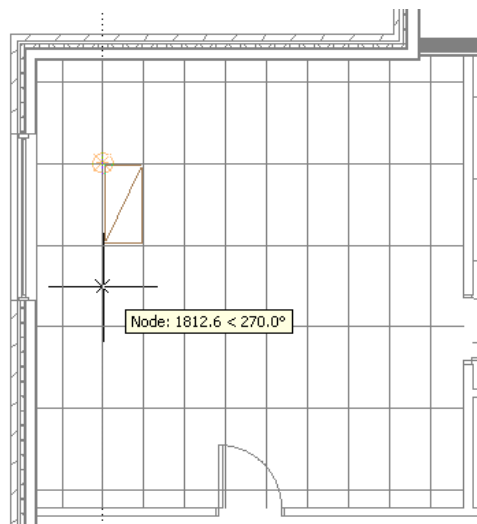
Do not change the value for Elevation; the light inherits the elevation of the ceiling grid.



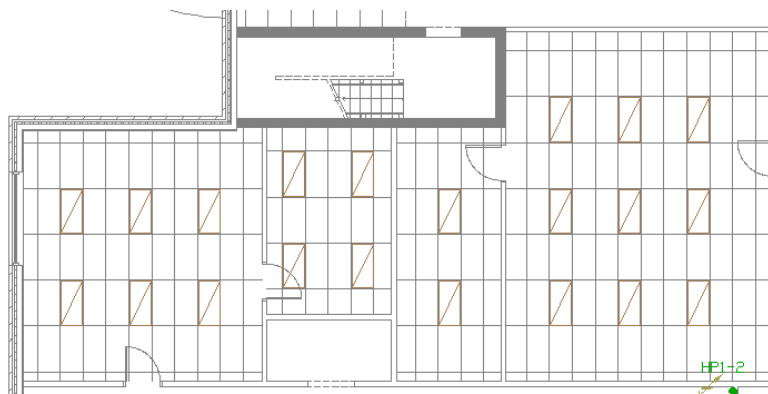
- 10 Click Electrical Properties.
- 11 In the Electrical Properties dialog, select HP1 for Show circuits from panel, and select circuit 3 for Circuit. Click OK.
- 12 Place the first light in the location shown, and click the Node snap.



13 Move the cursor as shown to rotate the light 270 degrees, and click to place the light.



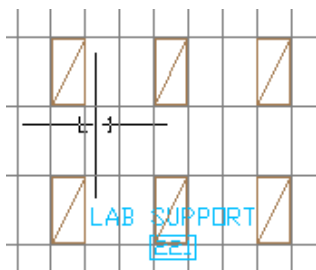
14 Add lights in the locations shown, and press Enter to end the command.



Add tags to the lights

15 Open the Tag and Schedule tool palette, and select the Lighting Device - Text tool.

16 Select one of the lights, and then specify the location of the tag as shown.



17 In the Edit Property Set Data dialog, scroll to GTagDeviceObjects.

18 For MarkAbbreviation, enter A, and for MarkUnderlineTextToggle, select False. Click OK.

19 Enter **m** (Multiple), and then select all of the remaining, untagged lights, and press Enter.

20 In the Edit Property Set Data dialog, specify the same values as for the first tag, and click OK. Press Enter.



TIP If you need to make a minor adjustment to the location of the tags, you can create a selection set that



includes the lights and the tags, then click (Quick Select) on the Properties palette, and use the Quick Select dialog to filter the selection set to include only the tags. You can then move the tags using the MOVE command.

21 Close the drawing without saving it.

In this exercise, you added lights to a ceiling grid.

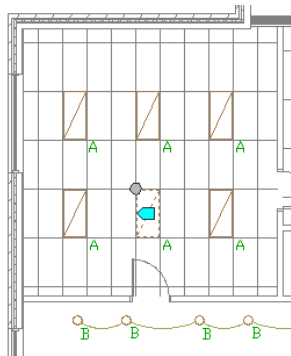
Exercise 2: Adding Emergency Lighting

In this exercise, you convert recessed lights to emergency lights.

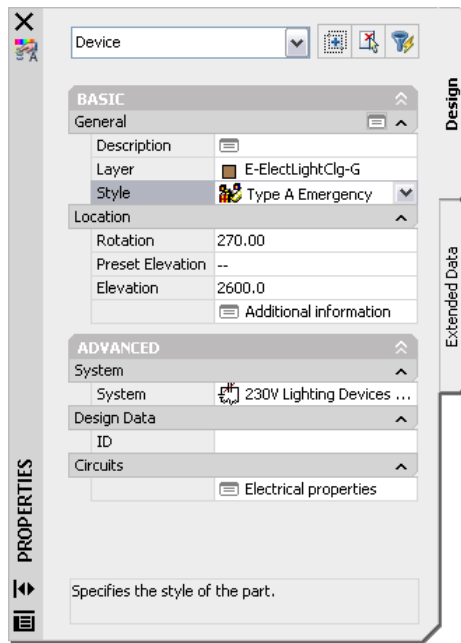
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L03_E02 under Constructs ► Lesson 3.

1 Select the light as shown.

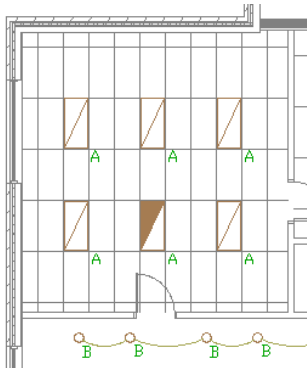


2 On the Design tab of the Properties palette, for Style, select Type A Emergency.



3 Press Esc to deselect the light.

The light is changed to an emergency light.



4 Use the previous steps to convert another light in the location shown.



5 Select both emergency lights.

6 On the Extended Data tab of the Properties palette, for MarkAbbreviation, enter A1.

7 Select one of the regular or emergency fluorescent lights in the Lab Support areas.

8 Right-click, and click Connected Objects ► Show Circuited Objects. Note that all of the lights are highlighted.

You do not have to connect a device with wire in order for it to be considered circuited. In this exercise, you assigned the lights to a circuit on the Properties palette, and now they are circuited even though they are not yet wired.

- 9 On the File menu, click Close, and click No when prompted to save the drawing.

Exercise 3: Adding Junction Boxes and Switches

In this exercise, you add junction boxes and switches to the lab support rooms.

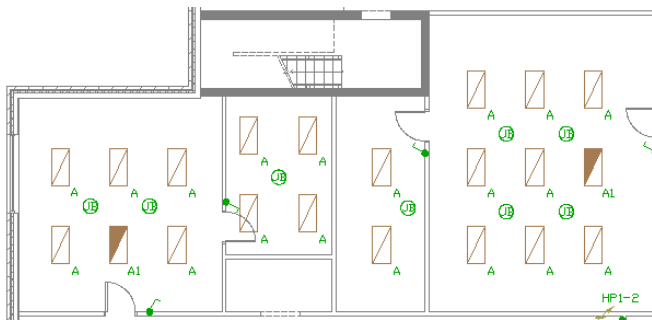
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L03_E03 under Constructs ► Lesson 3.

- 1 Change the display configuration to Electrical to turn off the ceiling grid.
- 2 Select OTRACK.
- 3 On the command line, enter **deviceadd**.
- 4 On the Design tab of the Properties palette, specify the following settings:
 - Expand General, and for Style, select Round Plain Junction Box.
 - Expand Location, and for Align to objects, select No.
 - Expand Tag, and for Insert tag, select *NONE*.
- 5 Add 8 junction boxes to the locations shown. Specify 0 for Rotation after you place each junction box, and use object tracking to align the junction boxes with each other. Press Enter to end the command.



- 6 On the Power-Lighting Device tool palette, select the Switches - Single Pole tool.
- 7 Add switches at each doorway as shown.



- 8 Close the drawing without saving.

In this exercise, you added junction boxes and switches.

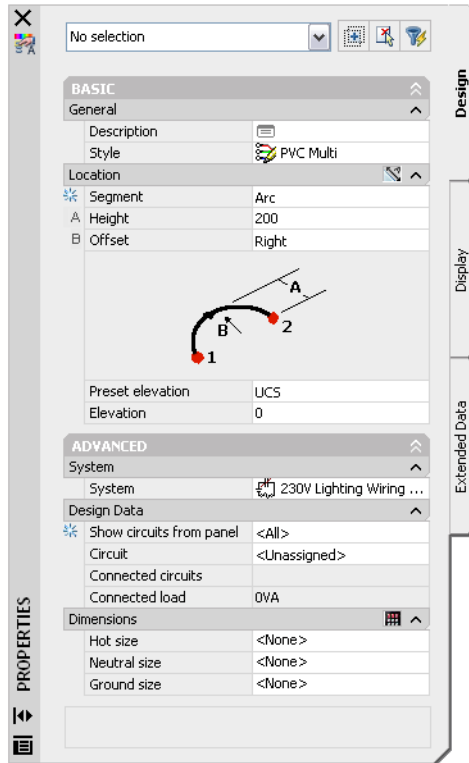
Exercise 4: Wiring Lab Support Lighting

In this exercise, you complete the lab support lighting by adding wiring.

Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L03_E04 under Constructs ► Lesson 3.

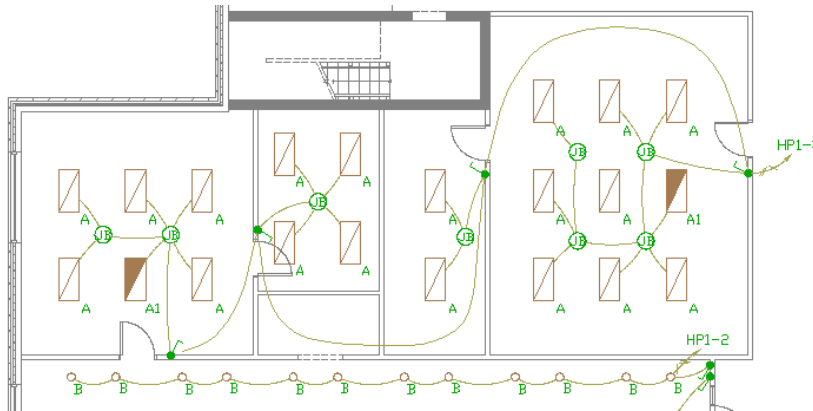
- 1 Click the Wire by System - 230V Lighting Wiring tool on the Wire tool palette, and specify the Property palette settings as shown.



- 2 Add wire runs to connect the lights to the junction boxes and the switches as shown. When drawing runs, remember to enter **n** when you want to start a new run without closing the command.

After you specify the first point of a wire segment, you can click an intermediate point for arcs. This enables you to route wire around drawing objects.

You can also change the segment to Spline to draw wires requiring more complex layouts.




After you add wires, you can modify their placement by selecting a wire segment and moving its Location grips.

- 3 Use the Home Run Label on the Annotation tool palette to add a home run label as shown in the previous image.

Calculate wire sizes in Circuit Manager

- 4 Click Electrical menu ► Circuits ► Circuit Manager.

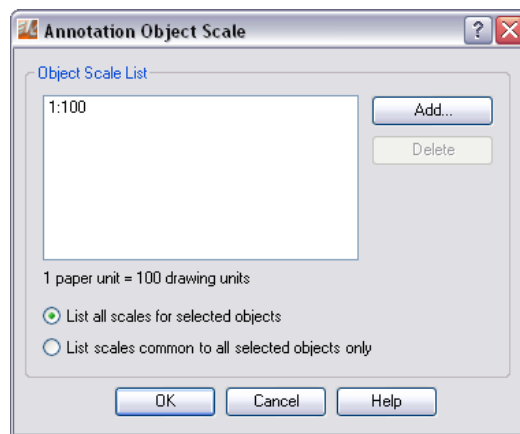
- 5 In the left pane, under HP1, select Power and Lighting.
- 6 In the right pane, select circuit 1, Lab 247 Fluorescent.
- 7 On the Circuit Manager, click  (Calculate wires).
- 8 In the Calculate Wire Sizes dialog, select Change All, and click OK.
- 9 Scroll to the right, and adjust the column widths to view the wire size calculations for circuit 1.



Wit Length	# of Poles	Voltage	Total Load	Demand Factor	Est Demand Load	Wires
known>	1	230	2304.00	Standard	2304.00	1x50mm2;1x50mm2;1x600mm2;-
known>	1	230	384.00	Standard	384.00	1x<None>;1x<None>;1x<None>;-
known>	1	230	2016.00	Standard	2016.00	<Undefined>

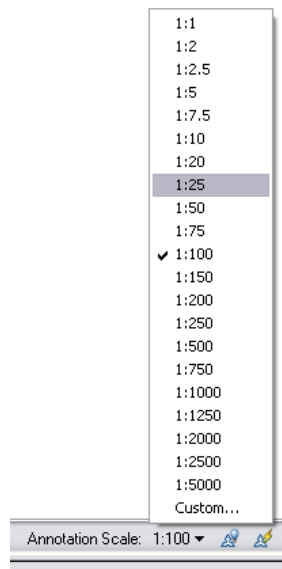
- 10 Repeat the 4 previous steps to calculate wire sizes for the other 2 circuits, and click OK.

Add an annotation scale to the tags

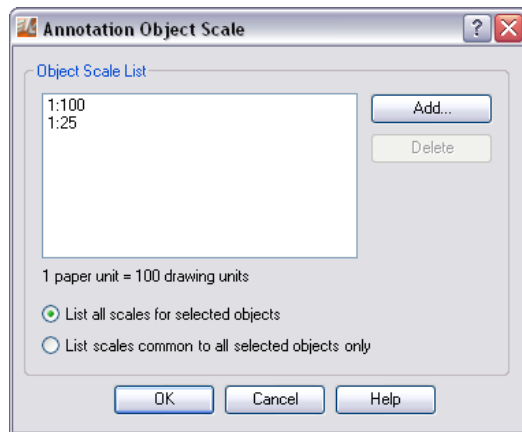
- 11 Select any tag, right-click, and click Annotative Object Scale ► Add/Delete Scales.



- 12 In the Annotation Object Scale dialog, note that the tag (like all of the other tags in the drawing) supports only the 1:100 scale representation. Click OK.
- 13 On the drawing window status bar, verify that the setting to automatically add scale representations to all annotative objects as the annotation scale changes is enabled. When the setting is enabled, the icon displays as  (colored), not as  (greyed out).
- 14 On the drawing window status bar, click the current annotation scale, and select 1:25 from the list.



- 15** Select any tag, right-click, and click Annotative Object Scale ► Add/Delete Scales.



- 16** Note that the tag (and all of the other tags in the drawing) now supports both the 1:100 and 1:25 scale representations.

- 17** Change the annotation scale back to 1:100.

- 18** Close the drawing without saving.

For reference, a completed drawing is included with the project dataset. The file, Completed_Lighting_Plan, is located in the Constructs\Lesson 3 directory.

3

Drawing a Power Plan and a Schematic Diagram

The exercises in these lessons offer instructions on how to use AutoCAD MEP to create a power plan and a power distribution diagram.

Lesson 4: Drawing a Power Plan

In this lesson, you learn how to use features to create power plans. You learn how to place receptacles using automatic and manual methods, and you also learn how to move devices using Location grips and automatic alignment.

Exercise 1: Generating Receptacles in a Room

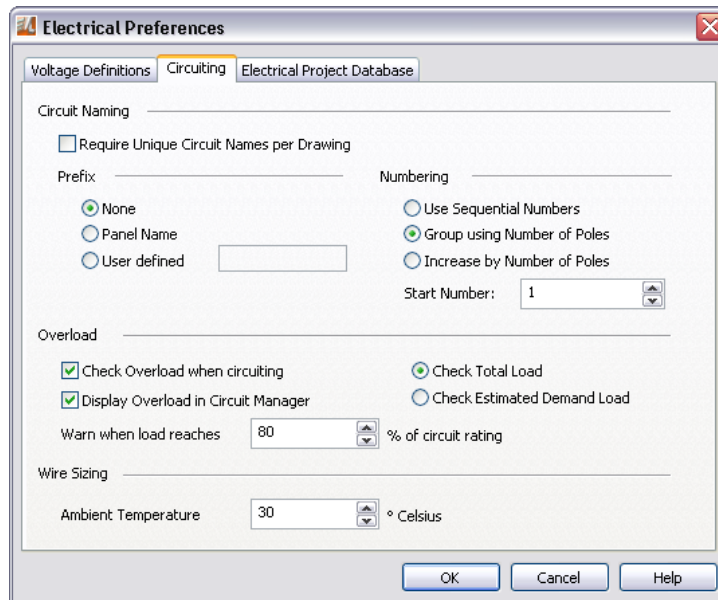
In this exercise, you place receptacles in a room using a layout method that enables you to generate receptacles with a set distance between each one. You also check circuit loads, and move devices from one circuit to another to prevent an overload condition.

Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L04_E01 under Constructs ► Lesson 4.

Turn on overload checking

- 1 Click Electrical menu ► Electrical Settings ► Electrical Preferences.
- 2 In the Electrical Preferences dialog, click the Circuiting tab.
- 3 Under Overload, verify that Check Overload when circuiting and Display Overload in Circuit Manager are both selected.

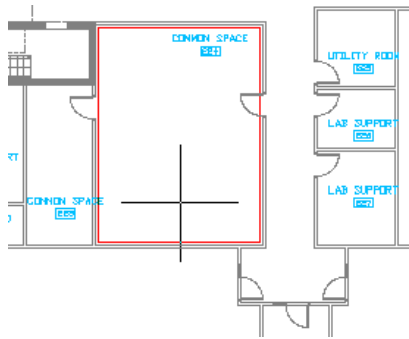


- 4 Click OK.

Generate a space

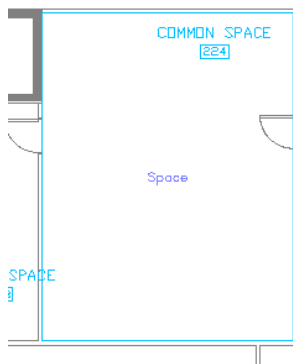
- 5 On the application status bar, deselect OSNAP.
- 6 Zoom in to Common Space 224.
- 7 On the Power-Lighting Devices tool palette, select the Space tool.
- 8 On the Properties palette, verify that Generate is selected for Create type, and specify the following settings:
 - Expand General, and for Associative, select Yes.
 - Expand Generate Space, and for Boundary set, select Reset visible boundaries.
 - For Filter boundary set, select Walls only.

9 Move the cursor inside Common Space 224, and click.



10 Press Enter to end the command.

The space is added to the room. It displays as a line around the room perimeter, and it is on a non-plotting layer. For electrical drawings, spaces are used solely to place devices.



11 Select the Space label, and press Delete to delete it.

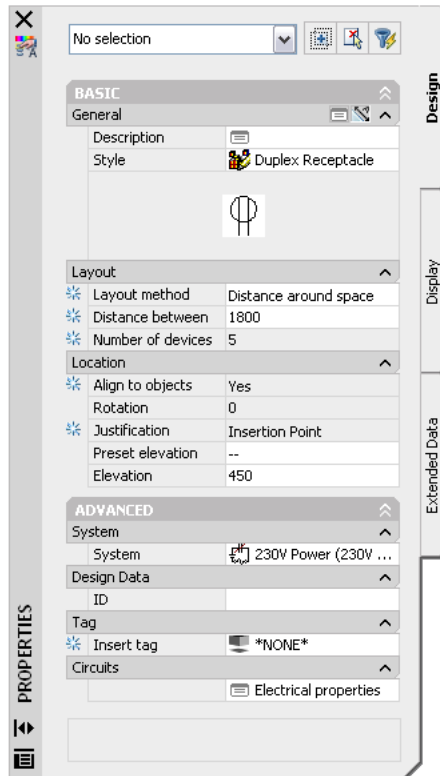
Generate receptacles

12 Enter **deviceadd**.

13 On the Design tab of the Properties palette, specify the settings as shown:

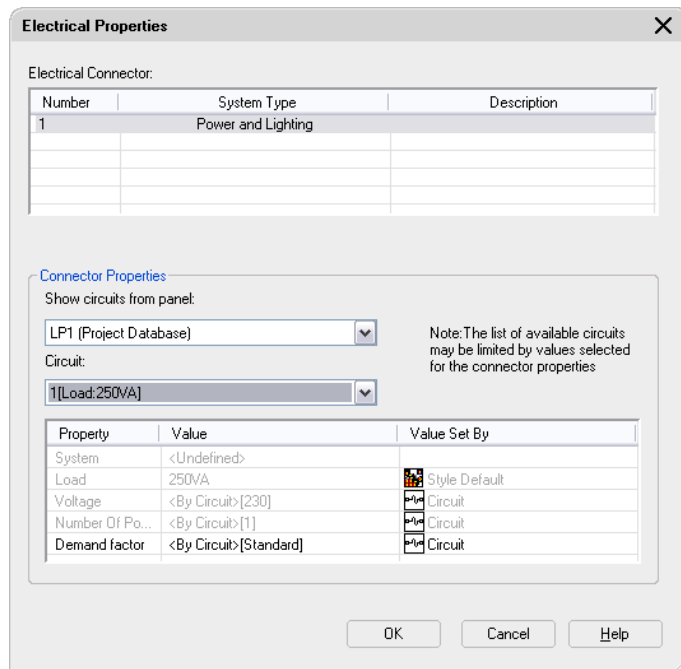
- Expand General, and for Style, select Duplex Receptacle. This device style is configured with a load.
- Expand Layout, and for Layout method, select Distance around space. This will place devices at a specific distance interval around the room.
- For Distance between, enter 1800.
- Expand Location, and for Elevation, enter 450.
- Expand System, and for System, select 230V Power (230V POWER).

- Expand Tag, and for Insert tag, select *NONE*.



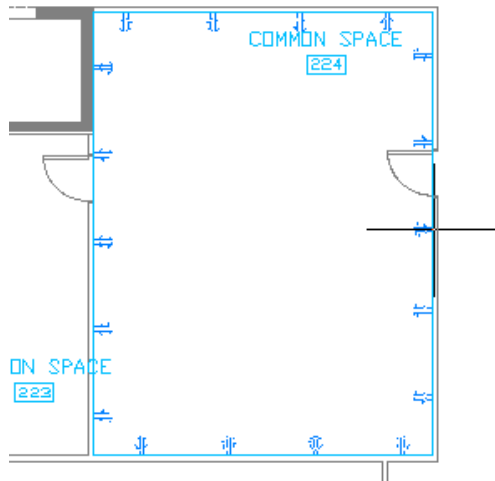
14 Under Circuits, click the Electrical Properties icon.

15 In the Electrical Properties dialog, select LP1 for Show circuits from panel, and select circuit 1 for Circuit.



16 Click OK.

17 Move the cursor to the space outline. Note how a preview of the device layout is displayed.

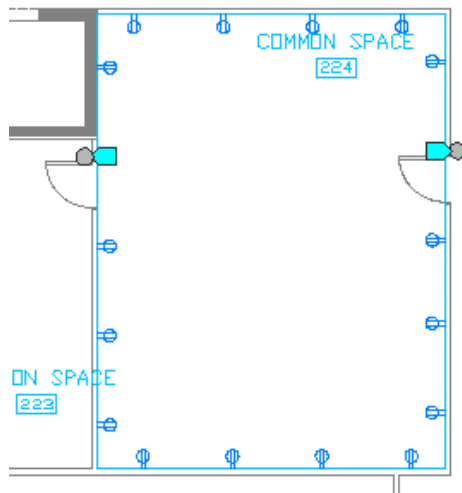


18 Click to place the devices in the approximate location shown in the previous image.

19 When prompted with the overload warning, click Yes.

20 Press Enter to end the add devices command.

21 Select the receptacles as shown, and press Delete to delete them.



Check the circuit loads

22 Click Electrical menu ► Circuits ► Circuit Manager.

23 Under LP1, select Power and Lighting.

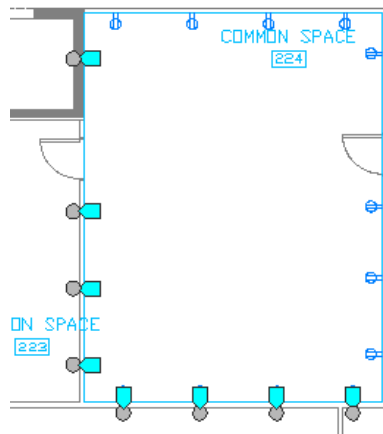
Note how circuit 1 is highlighted in red to display an overload condition.

Name	Description	System	Rating	Panel	# of Devices	Circuit Length	# of P...	Voltage	Total Load
1	Room 224 Outlets N & E Walls	230V Power	20	LP1	16	<Unknown>	1	230	4000.00
2	Room 224 Outlets W & S Walls	230V Power	20	LP1	0	<Unknown>	1	230	0.00
3	YAV Junction Box	230V Power	20	LP1	0	<Unknown>	1	230	0.00

24 Click OK.

Move devices to another circuit

25 Select the receptacles on the bottom wall and the left wall of Common Space 224.



26 On the Design tab of the Properties palette, under Advanced ► Circuits, click the Electrical Properties icon.

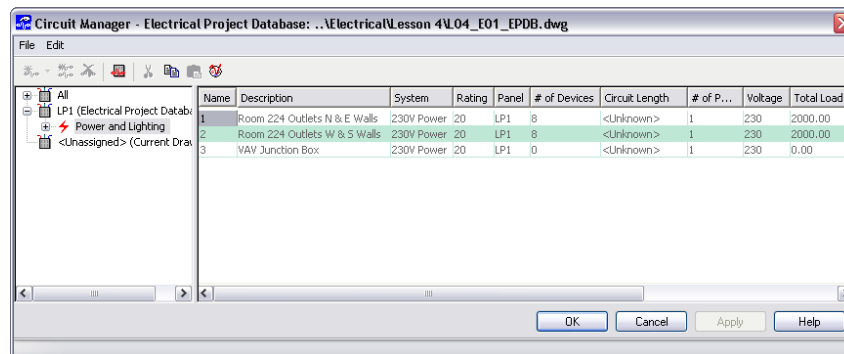
27 In the Electrical Properties dialog, specify circuit 2 for Circuit, and click OK.

28 Press Esc to deselect the receptacles.

29 Click Electrical menu ► Circuits ► Circuit Manager.

30 Under LP1, select Power and Lighting.

Note how the overload condition has been removed, and note the new loads on circuits 1 and 2.



31 Click OK.

32 Click File ► Close, and click No when prompted to save the drawing.

In this exercise, you learned how to use a spaces to layout receptacles in a room. You also used circuit features to check for overloads, and you fixed an overload condition by moving some devices to another circuit.

Exercise 2: Manually Placing Receptacles

In this exercise, you manually place devices. You also use grips and auto-alignment to move the devices in a room.

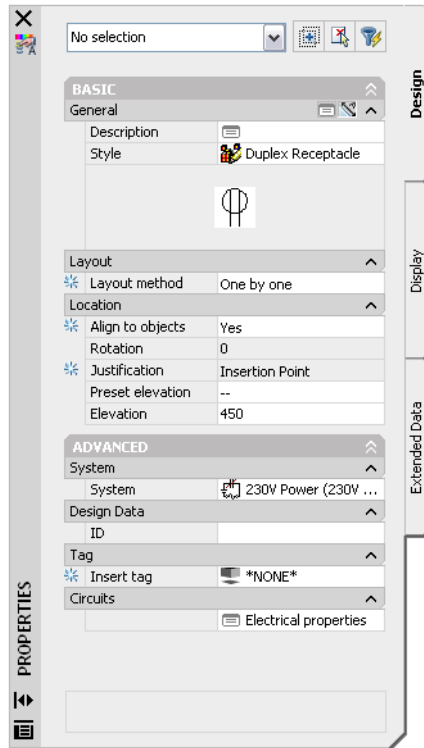
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L04_E02 under Constructs ► Lesson 4.

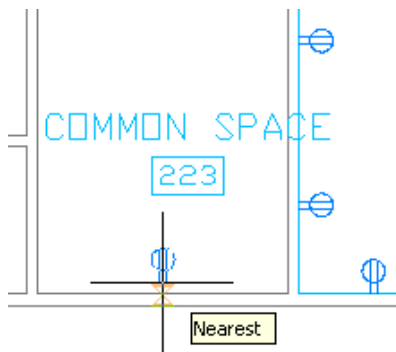
Manually insert a device

- 1 Select OSNAP.
- 2 Right-click OSNAP, and click Settings.
- 3 In the Drafting Settings dialog, click the Object Snap tab.

- 4 Click Clear All, select Nearest, and click OK.
- 5 On the command line, enter **deviceadd**.
- 6 In the Properties palette, specify the settings as shown:
 - Expand General, and for Style, select Duplex Receptacle.
 - Expand Layout, and for Layout method, select One by one.
 - Expand Location, and for Align to objects, select Yes.



- 7 Click the Electrical Properties icon.
- 8 In the Electrical Properties dialog, select LP1 for Show circuits from panel, select circuit 2 for Circuit, and click OK.
- 9 In the drawing, place the receptacle on the bottom wall of Common Space 223 as shown. Because you selected Yes for Align to objects on the Properties palette, the device will automatically align to the object to which you snap.

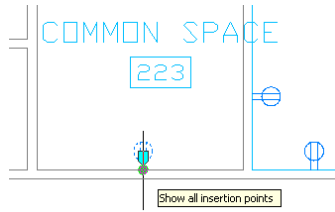


Zoom in or out as necessary to align the receptacle along the wall in the desired direction.

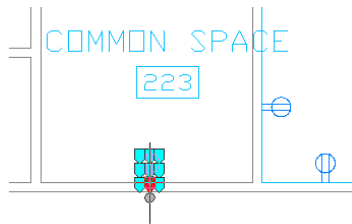
- 10 Press Enter to end the command.

Copy the receptacle to another wall

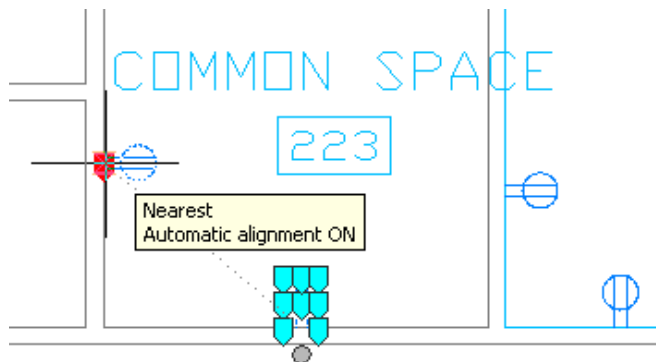
- 11 Select the receptacle, and click the Show all insertion points grip.



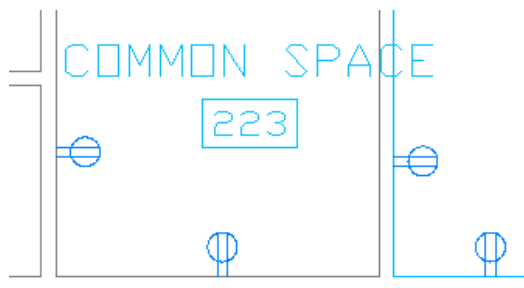
- 12 Press and hold Ctrl, and select the bottom-center insertion point as shown.



- 13 While still holding down the Ctrl key, move the receptacle to the left wall to display a Nearest snap as shown. Note how the receptacle automatically aligns to the wall surface.



- 14 Zoom in or out as necessary to orient the receptacle in the room, and click the Nearest snap to place a copy of the receptacle.
- 15 Press Enter to end the command, and press Esc to deselect the receptacle.



- 16 Click File ► Close, and click No when prompted to save the drawing.

In this exercise, you learned how to manually place devices. You also learned how to use insertion point grips to move and copy devices. You used auto-alignment to automatically orient devices along wall surfaces.

Exercise 3: Customizing a Device Style

In this exercise, you create a custom device style to configure a circuit load for a device. You create a junction box style for junction boxes that service variable air volume (VAV) boxes.

Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L04_E03 under Constructs ► Lesson 4.

Creating a custom style

- 1 Click Electrical menu ► Devices ► Styles.
- 2 In the left pane of the Style Manager, right-click Square Junction Box, and click Copy.
- 3 Right-click Device Styles, and click Paste.
- 4 Select Square Junction Box (2).
- 5 In the right pane, click the General tab.
- 6 For Name, enter VAV Square Junction Box.
- 7 Click the Connectors tab.
- 8 Specify the following settings:
 - For System Type, select Power and Lighting.
 - For Load, enter 2500 VA, and for Prevent Override, select Yes.

The screenshot shows the 'Connectors' tab in the Style Manager. It displays a table with three columns: Property Name, Value, and Prevent Override. The table is expanded for 'Connector 1'.

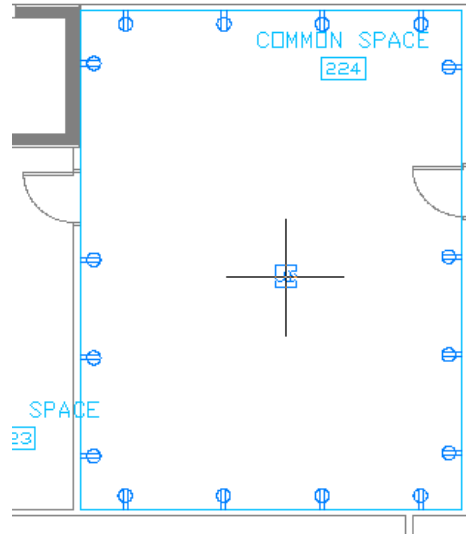
Property Name	Value	Prevent Override
Connector 1		
Description		
System Type	Power and Lighting	
Connection Point X	0	
Connection Point Y	0	
Connection Point Z	0	
Number of Poles	<Undefined>	No
Voltage	<Undefined>	No
Load	2500 VA	Yes
Demand Factor	<Undefined>	No

- 9 Click OK.

Add the junction box to the drawing

- 10 Enter **deviceadd**.
- 11 In the Properties palette, specify the following settings:
 - Expand General, and for Style, select VAV Square Junction Box.
 - Expand Layout, and for Layout method, select One by one.
- 12 Use the Electrical Properties worksheet to assign the junction box to circuit 3 of panel LP1.

- 13 Place the junction box approximately in the middle of Common Space 224 as shown, and press Enter to end the command.



- 14 Use the Circuit Manager to view the circuit loads for the devices in this power plan. Note how the load you configured for the VAV junction box device style is applied to circuit 3.
- 15 Click File ► Close, and click No when prompted to save the drawing.

In this exercise, you learned how to create a custom device style. You specified this style for the device when you added it to the drawing.

In this lesson, you learned how to work with devices to create a power plan. For reference, a completed drawing named Completed_Power_Plan is included in the Constructs\Lesson 4 directory.

Lesson 5: Drawing a Schematic Diagram

In this lesson, you create part of a schematic diagram for a power distribution system.

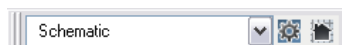
Exercise 1: Starting the Schematic Diagram

In this exercise, you start the diagram by adding symbols and drawing schematic lines. You add the main utility transformer, and you add the fuses and the switches for the main distribution panel.

Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L05_E01 under Constructs ► Lesson 5.

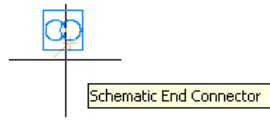
- 1 Select Schematic on the Workspaces toolbar.



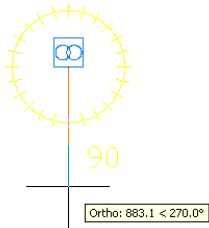
- 2 On the application status bar, select ORTHO.
- 3 Enter **symboladd**.
- 4 On the Design tab of the Properties palette, select Transformer Electrical for Style, and select E-400V Power for System.
- 5 Place the transformer in the drawing as shown, enter 0 for Rotation, and press Enter twice to end the command.



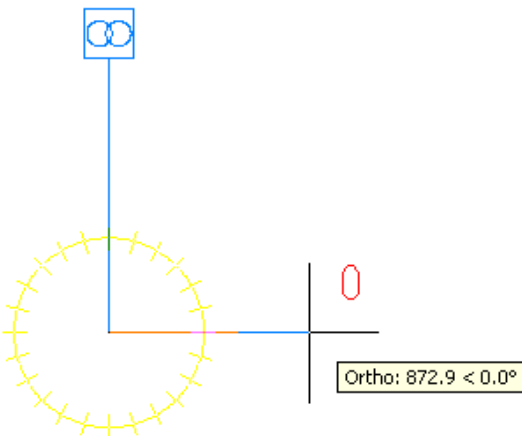
- 6 On the Electric tool palette, select the Schematic Line tool.
- 7 On the Design tab of the Properties palette, select Wire for Style, and select E-400V Power for System.
- 8 Move the cursor to the bottom of the transformer to display the Schematic End Connector.



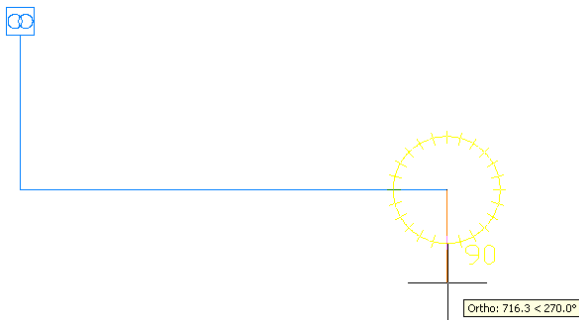
- 9 Click on the end connector snap to start the schematic line.
- 10 Move the cursor down as shown, enter 1200, and press Enter.



- 11 Move the cursor to the right as shown, enter 3300, and press Enter.

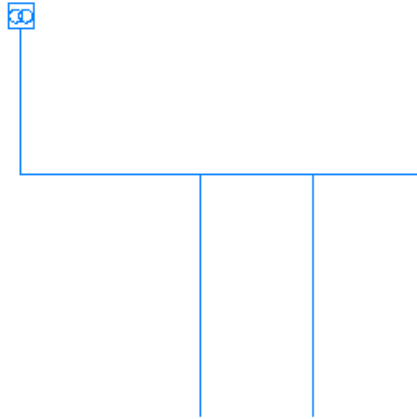


- 12 Move the cursor down again as shown, and enter 2000.



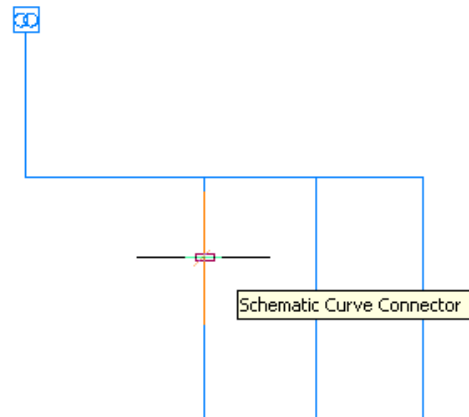
- 13 Press Enter twice to end the command.

- 14 Use the schematic line tool to add 2 more schematic lines as shown. Use the schematic curve connectors to connect the lines with the first run.



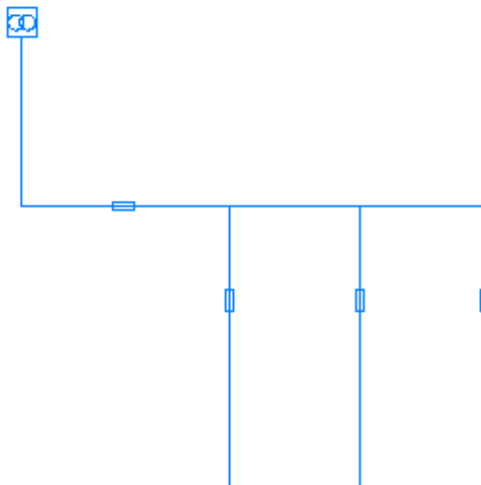
- 15 On the Electric tool palette, select the Fuse tool.

- 16 Move the cursor to the first line as shown, and click the schematic curve connector to specify the insertion point.



- 17 Move the cursor to rotate the fuse along the schematic line, and click to place the fuse.

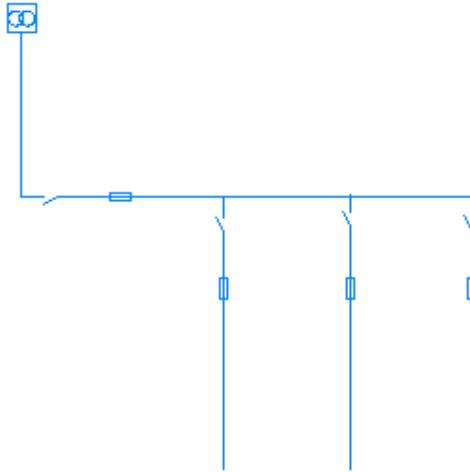
- 18 With the command still active, place 3 more fuses as shown, and then end the command.



- 19 On the command line, enter **symboladd**.

- 20 On the Design tab of the Properties palette, select Single Throw Electrical for Style.

21 Place the switches before each of the fuses as shown.



22 Click File ► Close, and click No when prompted to save the drawing.

In this exercise, you added schematic symbols and lines.

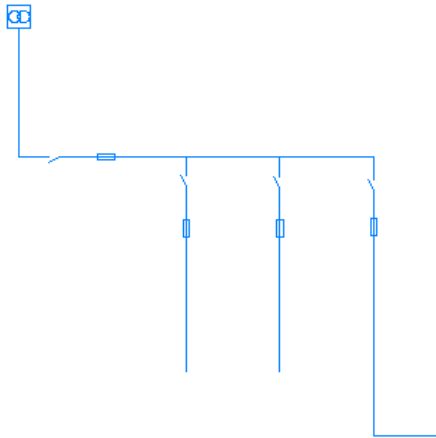
Exercise 2: Continuing the Diagram

In this exercise, you add to the schematic diagram by adding more schematic lines and symbols. You add circuit breakers for other distribution panels, and you add some high and low voltage panels.

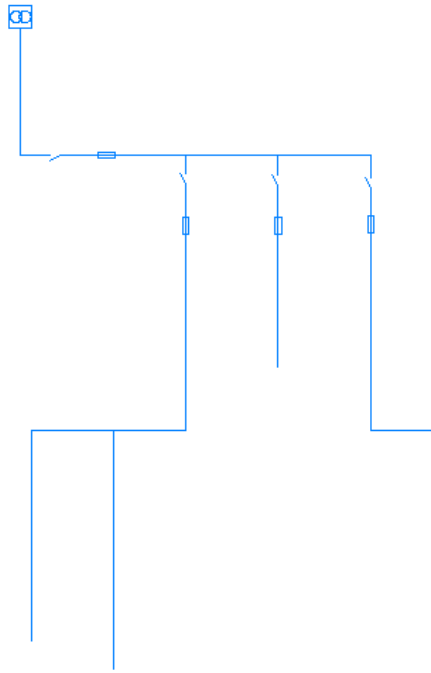
Dataset

On the Constructs tab of the Project Navigator, double-click Electrical_L05_E02 under Constructs ► Lesson 5.

- 1 If the Schematic workspace is not active, select Schematic on the Workspaces toolbar.
- 2 On the Electric tool palette, select the Schematic Line tool.
- 3 Starting at the end of the last line, draw a line 600 mm down and 600 mm to the right as shown.

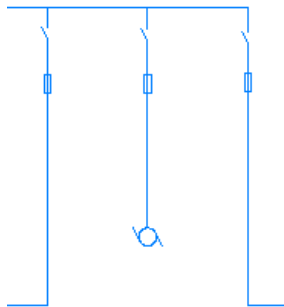


4 On the first line, add schematic lines as shown.

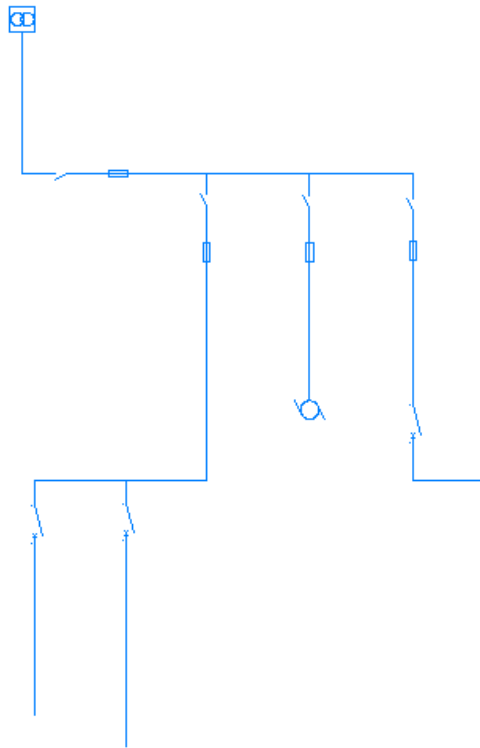


5 On the Electric tool palette, select the Motor tool.

6 Add the motor symbol to the end of the middle line as shown.

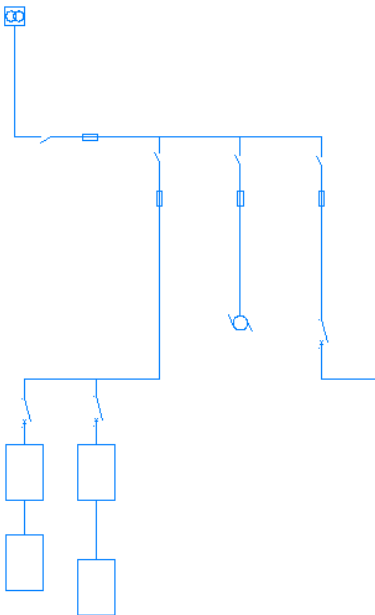


7 On the Electric tool palette, select the Circuit Breaker tool, and add 3 circuit breakers as shown.



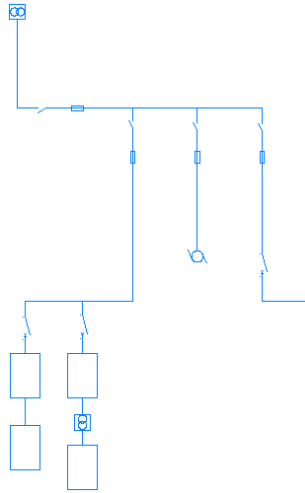
8 Enter **symboladd**, and on the Design tab of the Properties palette, select Panel Generic Electrical for Style.

9 Add 4 panels as shown.



10 Enter **symboladd**, and on the Design tab of the Properties palette, select Transformer Electrical for Style.

- 11 Add a transformer between the panels as shown.



- 12 Click File ► Close, and click No when prompted to save the drawing.

In this exercise, you added circuit breakers for the distribution panels, and you added panels.

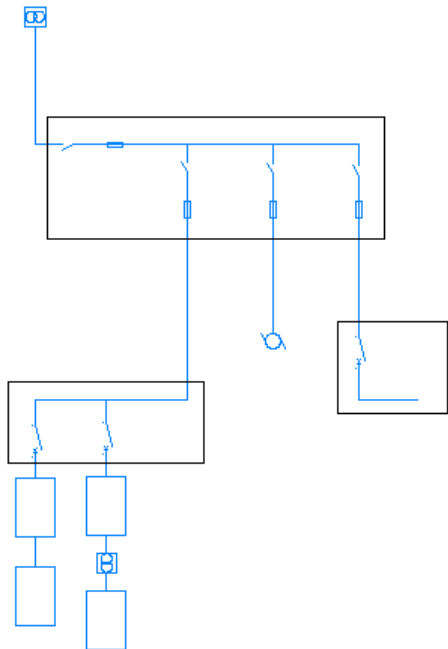
Exercise 3: Completing the Diagram

In this exercise, you label the components to complete the power distribution diagram.

Dataset

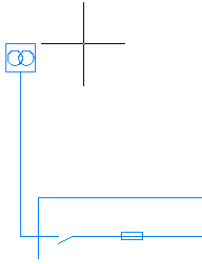
On the Constructs tab of the Project Navigator, double-click Electrical_L05_E03 under Constructs ► Lesson 5.

- 1 Enter **rectang**.
- 2 Draw rectangles as shown to represent the main and secondary distribution panels.



- 3 The rectangles are on layer 0. Select the rectangles, and select Z-Schematic-G on the Layer Properties toolbar to place them on the same layer as the other components.
- 4 On the Annotation tool palette, select the Text tool.

5 Specify the text location as shown.



6 Enter 0 for text width.


7 Enter the following lines of text:

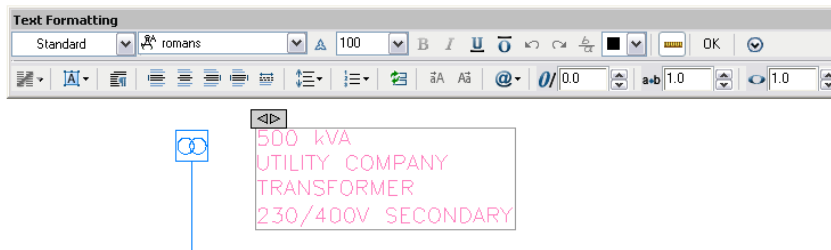
- 500 kVA
- UTILITY COMPANY
- TRANSFORMER
- 230/400V SECONDARY

8 When you are done entering lines of text, press Enter to end the command.

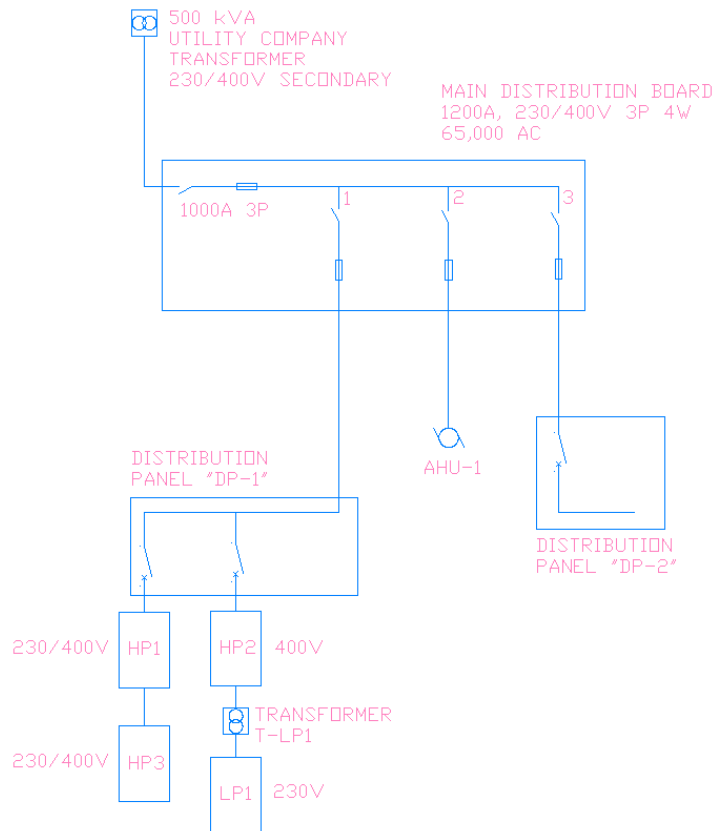
9 Select the text, right-click, and click MText Edit.

10 Select all of the text in the text box.

11 On the Text Formatting toolbar, select Standard for Style, romans for Font, de-select  (Annotative), enter 100 for Text Height, and click OK.



12 Add text to the following areas as shown to complete the diagram.



13 Click File ► Close, and click No when prompted to save the drawing.

In this exercise, you added text to label the main components of the diagram.

In this lesson, you completed a portion of a power distribution diagram. For reference, a completed drawing named Completed_Power_Diagram is included in the Constructs\Lesson 5 directory.

Creating Electrical Construction Documents

4

The lessons in this chapter show you how to create construction documents for an electrical system.

Lesson 6: Creating Electrical Views

In this lesson, you learn how to create different views using the construct you created in the previous lessons. You learn how to generate detail views and create schedule views using a completed construct drawing provided for your convenience. In the next lesson, these views will be placed on sheets to create construction documents.


A set of completed view drawings is included for reference in the Lesson 6 Completed Views category on the Views tab of the Project Navigator. Each view drawing name includes the lesson and exercise number for the corresponding exercise. For example, Electrical_L06_E03 is the completed drawing for lesson 6, exercise 3 in this tutorial.

This lesson is sequential. Be sure to complete the exercises in the order presented. Unlike the previous exercises, you save your drawings in this lesson and use them to create sheets in the next lesson.

Exercise 1: Creating an Electrical Plan View

In this exercise, you create a general view drawing for the electrical system.

Create a new view directory for the new drawings

- 1 In the Project Navigator, click the Project tab, and verify the current project is Electrical Tutorial. If not, use the Project Browser to specify this tutorial as the current project.
- 2 Verify that the current workspace is set to Electrical.
- 3 Verify that a drawing is open. If no drawing is open, click . (You cannot edit project settings, such as add a Views category, unless a drawing is open.)
- 4 In the Project Navigator, click the Views tab.
- 5 Right-click Views, and click New Category.
- 6 Rename the new category Lesson 6 Work.

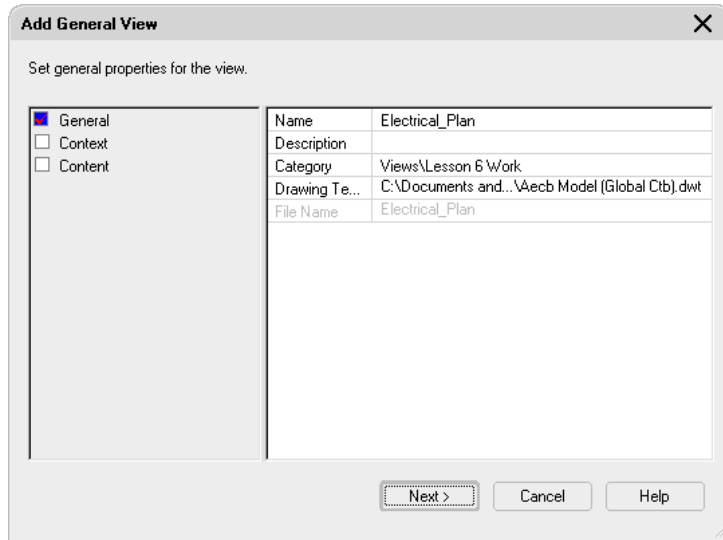
There are now 2 view categories.



Create a general view of the electrical system

- 7 Right-click Lesson 6 Work, and click New View Dwg ► General.
- 8 In the Add General View dialog, for Name, enter Electrical_Plan.

- 9 Verify that Category is set to Views\Lesson 6 Work. If not, you can click in the Category field, and select Lesson 6 Work from the drop-down menu.



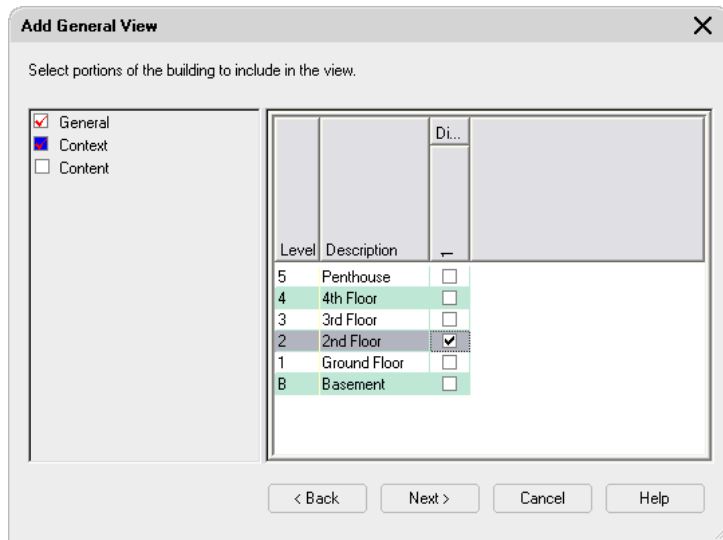
The 'Add General View' dialog box is shown. It has a title bar with a close button. Below the title bar is the instruction 'Set general properties for the view.' On the left is a list of tabs: 'General' (selected with a blue square), 'Context' (with a white square), and 'Content' (with a white square). On the right is a table with the following data:

Name	Electrical_Plan
Description	
Category	Views\Lesson 6 Work
Drawing Te...	C:\Documents and...\Aecb Model (Global Ctb).dwt
File Name	Electrical_Plan

At the bottom are three buttons: 'Next >', 'Cancel', and 'Help'.

- 10 Click Next.

- 11 Select 2nd Floor. The construct developed in the previous lesson is assigned to the 2nd floor. The floor plan drawing is also assigned to the 2nd floor. On the next worksheet of the dialog, you specify the xrefs to include in the view. The available xrefs are the ones assigned to the same level you specify here.



The 'Add General View' dialog box is shown. It has a title bar with a close button. Below the title bar is the instruction 'Select portions of the building to include in the view.' On the left is a list of tabs: 'General' (with a red checkmark), 'Context' (with a blue square), and 'Content' (with a white square). On the right is a table with the following data:

Level	Description	Di...
5	Penthouse	<input type="checkbox"/>
4	4th Floor	<input type="checkbox"/>
3	3rd Floor	<input type="checkbox"/>
2	2nd Floor	<input checked="" type="checkbox"/>
1	Ground Floor	<input type="checkbox"/>
B	Basement	<input type="checkbox"/>

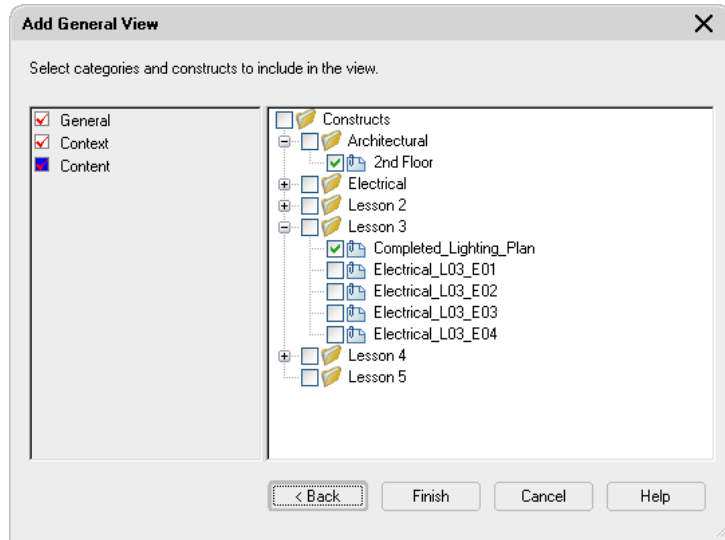
At the bottom are four buttons: '< Back', 'Next >', 'Cancel', and 'Help'.

TIP You can select more than one floor to include constructs from multiple floors in the same view.

- 12 Click Next.

- 13 Specify the drawings to xref into your view. Scroll to the top, deselect Constructs to deselect all of the drawings, and select the following drawings:

- Architectural ► 2nd Floor



The drawings you specify here are included as xrefs in the view drawing. If a construct drawing has an xref overlay, the xref overlay is not transferred to the view. If a construct drawing has an attached xref, then the xref drawing information is transferred to the view. The *Completed_Lighting_Plan* drawing includes the 2nd Floor drawing as an xref overlay, so it will not display in the view unless you select it here.

Note how this view drawing references the electrical lighting plan construct. If you modify the construct drawing, you simply need to open the view drawing or reload the construct xref to display the most current drawing on the view.

14 Click Finish.

Open the new view drawing

15 Double-click *Electrical_Plan* to open it.

The grid markers are displayed, the floor plan shows the entire 2nd floor, and the ceiling grid is displayed. Next, you modify the view drawing to change these aspects.



16 On the application status bar, deselect Grid.

17 Click any line on the floor plan to select it.

18 Right-click, and click Clip Xref.

19 On the command line, enter **n** for new clipping boundary.

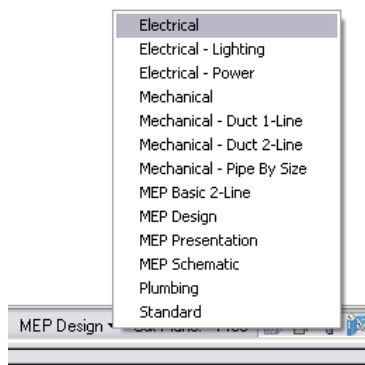
20 Enter **r** for rectangular clipping boundary.

- 21 Starting at the lower-left corner of the building, draw a clipping boundary around the left half of the building as shown.



- 22 Click  (Zoom Extents).

- 23 To turn off the ceiling grid, click MEP Design on the application status bar, and specify Electrical as the current display configuration.



NOTE The Aecb Model (Global) template contains an incorrect setting for ceiling grid displays. The ceiling grid is displayed in the Electrical display configuration. Use the following steps to turn it off.

- Click Format menu ► Display Manager.
- In the left pane of Display Manager, expand Representations by Object under the current drawing name, and select Ceiling Grid.
- In the right pane, clear Plan in the Electrical - Plan column, and click OK.

The view drawing is completed.



NOTE For more information on display configuration settings, see “Display Configurations” in the AutoCAD MEP Help.

- 24 Click File menu ► Save, and leave the drawing open for the next exercise.

In this exercise, you created a new general view drawing and referenced the electrical construct. If you had any problems with this exercise, you can view the completed drawing for this exercise in the Views\Lesson 6 Completed Views category. Next, you create a detail view from the view drawing you created in this exercise.

Exercise 2: Adding a Detail View

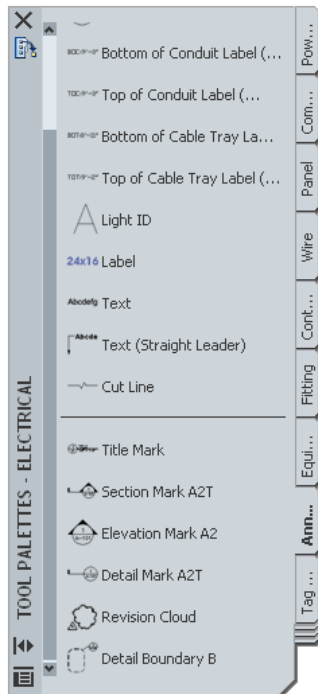
In this exercise, you create a detail view. You add a detail mark to the plan view drawing, and then you create the detail in its own view drawing.

Create a detail view

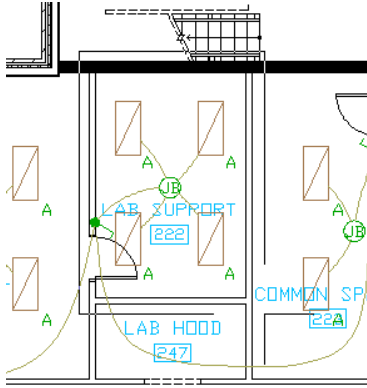
- 1 Verify that the Electrical_Plan view drawing from the previous exercise is open. If not, double-click it on the Views tab of the Project Navigator under Views\Lesson 6 Work.
- 2 Pan and zoom so that Lab Support 222 is centered in the drawing window.

TIP An efficient way to navigate the drawing window is to use the scroll wheel on the mouse. Turn the wheel to zoom in or out, hold it down and drag to pan, or double-click it to zoom extents. You can use these features even if a command is active. For more information, see “Pointing Device Buttons” in the AutoCAD Help.

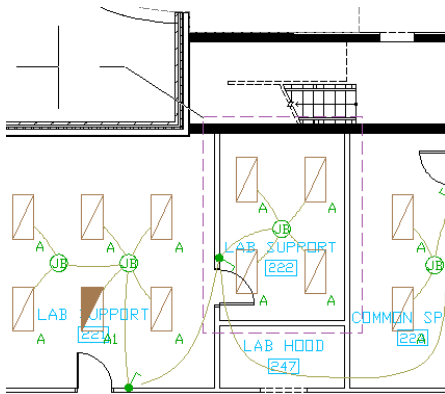
- 3 In the Electrical tool palettes group, open the Annotation tool palette, and select the Detail Boundary B tool.



- 4 Note the command line prompts. In the drawing, specify the corner points for the boundary annotation as shown.

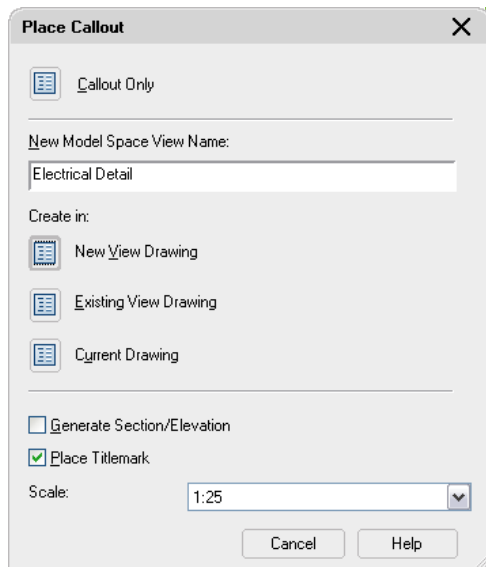


- 5 Move the cursor outside of the floor plan as shown, click to specify the detail mark insertion point, and press Enter.

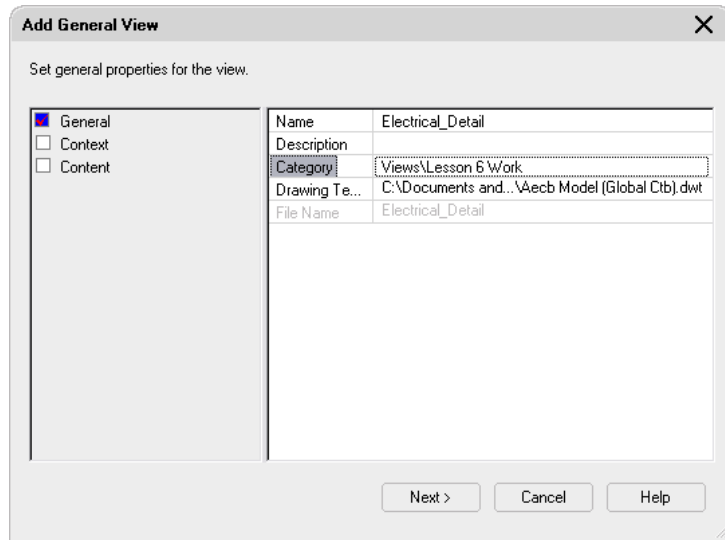


- 6 In the Place Callout dialog, specify the following precisely in the order listed:

- For New Model Space View Name, enter Electrical Detail.
- Clear Generate Section/Elevation.
- Verify that Place Titlemark is selected.
- Verify that Scale is set to 1:25.



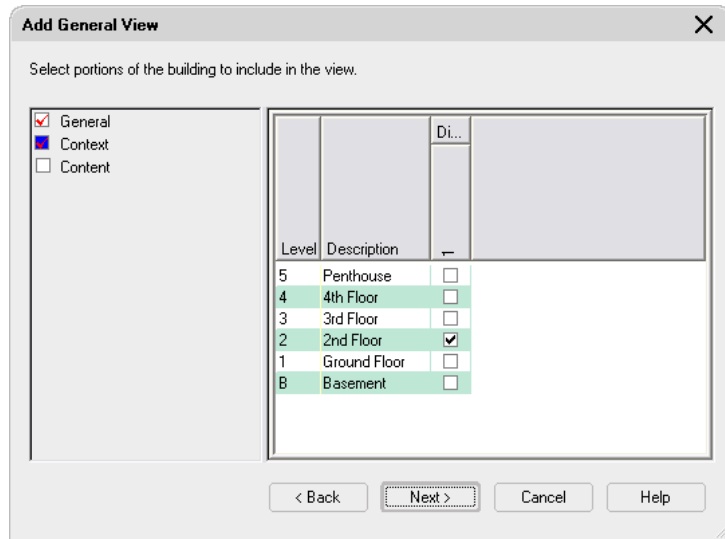
- 7 Click New View Drawing.
- 8 In the Add General View dialog, for Name, enter Electrical_Detail for Name, and specify Views\Lesson 6 Work for Category.



The 'Add General View' dialog box is shown. It has a title bar with a close button (X). The main area is titled 'Set general properties for the view.' On the left, there are three checkboxes: 'General' (checked), 'Context', and 'Content'. On the right, there are several text fields: 'Name' (Electrical_Detail), 'Description' (empty), 'Category' (Views\Lesson 6 Work), 'Drawing Te...' (C:\Documents and...\Aecb Model (Global Ctb).dwt), and 'File Name' (Electrical_Detail). At the bottom, there are three buttons: 'Next >', 'Cancel', and 'Help'.

Name	Electrical_Detail
Description	
Category	Views\Lesson 6 Work
Drawing Te...	C:\Documents and...\Aecb Model (Global Ctb).dwt
File Name	Electrical_Detail

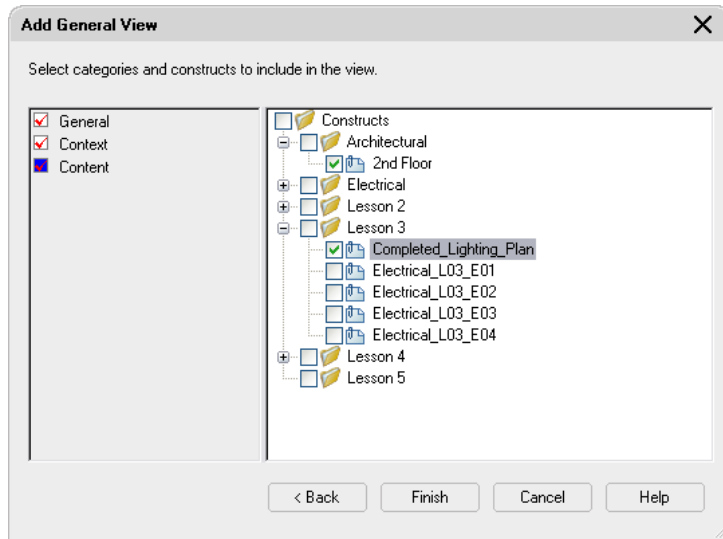
- 9 Click Next.
- 10 Select 2nd Floor, and click Next.



The 'Add General View' dialog box is shown. It has a title bar with a close button (X). The main area is titled 'Select portions of the building to include in the view.' On the left, there are three checkboxes: 'General' (checked), 'Context' (checked), and 'Content' (unchecked). On the right, there is a table with columns 'Level', 'Description', and 'Di...'. The table lists levels from 5 (Penthouse) to B (Basement). The '2nd Floor' row is selected, indicated by a checkmark in the 'Di...' column. At the bottom, there are four buttons: '< Back', 'Next >', 'Cancel', and 'Help'.

Level	Description	Di...
5	Penthouse	<input type="checkbox"/>
4	4th Floor	<input type="checkbox"/>
3	3rd Floor	<input type="checkbox"/>
2	2nd Floor	<input checked="" type="checkbox"/>
1	Ground Floor	<input type="checkbox"/>
B	Basement	<input type="checkbox"/>

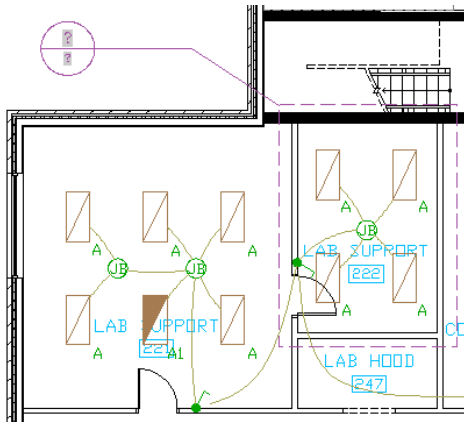
- 11 For xrefs to include in the detail, select 2nd Floor and Lesson 3\Completed_Lighting_Plan.



- 12 Click Finish.

IMPORTANT You still need to specify the detail boundary for the model space view. The boundary you added in a previous step is annotation only; proceed to the next step to define the view boundary.

- 13 Note the command line prompts. Specify the corners for the rectangular boundary that defines the model space view size for the detail. It is recommended that you approximate the boundary annotation you added in an earlier step.



Note that the view and sheet numbers in the detail mark each display as a question mark (?). When you place the detail view on a sheet, this mark will automatically update to reflect the detail and sheet numbers for the detail sheet.

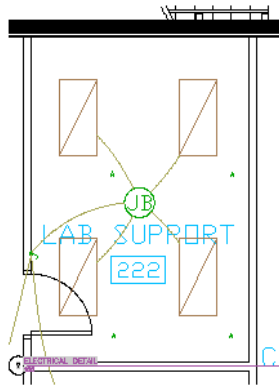
The new detail view drawing is created and added to the Views\Lesson 6 Work category. It is not opened. Next, you add an elevation view using your Electrical_Plan drawing.

- 14 Save the Electrical_Plan view drawing, and close it.

WARNING Dynamic links between marks and sheets use a fixed file path. If you change the view drawing file name, rename its Views category, or move it into a different Views category, the link will be broken, and mark numbers will display as question marks (?). You can recreate the views, or you can manually edit the mark and sheet titles by selecting the mark or view title, right-clicking, and selecting Edit Attributes.

Open the new view drawing

- 15 On the Views tab of Project Navigator, under Lesson 6 Work, double-click Electrical_Detail.
- 16 Zoom extents, and change the current display configuration to Electrical.



NOTE The Aecb Model (Global) template contains an incorrect setting for ceiling grid displays. The ceiling grid is displayed in the Electrical display configuration. Use the following steps to turn it off.

- Click Format menu ► Display Manager.
 - In the left pane of Display Manager, expand Representations by Object under the current drawing name, and select Ceiling Grid.
 - In the right pane, clear Plan in the Electrical - Plan column.
 - Click OK to close Display Manager.
-


- 17 Save the Electrical_Detail drawing, and close it.

In this exercise, you created a detail view drawing directly from the plan view drawing you created in the previous exercise.

Exercise 3: Creating a Panel Schedule

In this exercise, you create a panel schedule for the circuits. First, you create a general view drawing and xref the lighting plan. You then add the panel schedule to the view drawing.

Create a general view drawing

- 1 A drawing must be open in order to add a new view drawing. If no drawing is open, click  to open a new drawing.
- 2 On the Views tab of the Project Navigator, right-click Lesson 6 Work, and click New View Dwg ► General.
- 3 In the Add General View dialog, enter Electrical_Panel_Schedule for Name, and verify that Views\Lesson 6 Work is specified for Category.
- 4 Click Next.
- 5 Select 2nd Floor, and click Next.
- 6 Deselect Constructs so that no drawings are selected, and click Finish.
- 7 On the Views tab of the Project Navigator, double-click Electrical_Panel_Schedule to open it.
- 8 Click Electrical menu ► Electrical Settings ► Electrical Preferences.
- 9 In the Electrical Preferences dialog, click the Electrical Project Database tab.
- 10 For Project, browse to the My Documents\Autodesk\My Projects\Electrical Tutorial\Constructs\Electrical folder, select Completed_Power_EPDB, and click Open.

- 11 Select Use Relative Path, and click OK.
- 12 In the Electrical Project Database Reload dialog, click OK. (Do not select Remove stored data from the Electrical Project Database.)
- 13 On the Tag and Schedule tool palette, select the Panel Schedule tool.
- 14 Specify the settings as shown.

Panel Schedule

Panel: LP1 (Completed_Power_EPDB) Scale: 100

Service: Power and Lighting Supply Voltage: 230V

Location: Incomer Type/Rating: 100A

Fed From: L2 Feed Cable Details:

OK Cancel

- 15 Click OK, and specify an insertion point for the upper-left corner of the panel schedule.

Panel Ref: NR1	Supply Voltage: 230V
Service: Power and Lighting	Incomer Type/Rating: 100A
Location:	Number of Ways: 24
Fed From: L2	Feed Cable Details:

Circuit Ref	Circuit Description	Protective Device			Cable mm²	Load (Watts)		
		Type	Amps	Curve		L1	L2	L3
1	Room 224 Outlets N & E Walls		20			2000*		
2	Room 224 Outlets S & W Walls		20			2500*		
3	VAV Junction Box		20			2500*		
Totals						0	0	0

* Circuit load not associated to phase Total Installed Load:- 0 kW


- 16 Save the drawing, and close it.

In this exercise, you created a view drawing, and added a panel schedule to it.

Exercise 4: Creating an Equipment Schedule

In this exercise, you create a schedule for the lights in the electrical plan. You add the schedule to a view drawing, and then you link to the electrical construct drawing. The schedule is populated with lights data from the construct drawing.

Create a blank, general view drawing

- 1 A drawing must be open in order to add a new view drawing. If no drawing is open, click  to open a new drawing.
- 2 On the Views tab of the Project Navigator, right-click Lesson 6 Work, and click New View Dwg ► General.
- 3 In the Add General View dialog, enter Electrical_Schedule for Name, and verify that Views\Lesson 6 Work is specified for Category.
- 4 Click Next.
- 5 Do not select any floors, and click Next.
- 6 Verify that no construct drawings are selected, and click Finish. You do not need to xref any drawings if you only want to add component schedules to a view drawing.
- 7 On the Views tab of the Project Navigator, double-click Electrical_Schedule to open it.

Copy a style for a lighting schedule from a construct drawing

- 8 On the Constructs tab, double-click Completed_Lighting_Plan in the Lesson 3 category. A modified lighting device schedule table style is provided in this drawing.

- 9 Click Format menu ► Style Manager.
- 10 In the Style Manager, expand the Completed_Lighting_Plan directory.
- 11 Expand Documentation Objects ► Schedule Table Styles, and select Electrical Lighting Device Schedule. Right-click, and click Copy.
- 12 Under Electrical_Schedule, expand Documentation Objects. Right-click Schedule Table Styles, and click Paste.
- 13 Click OK, and close the Completed_Lighting_Plan drawing.

Add a schedule

- 14 Verify that Electrical_Schedule is the current drawing.
- 15 In the Electrical tool palettes group, open the Tag and Schedule palette, and select the Lighting Device schedule tool.
- 16 Note the command line prompts. Press Enter. (You will link to an external drawing after you add the schedule.)
- 17 Click to specify the location for the upper-left corner of the schedule table, and press Enter to automatically size the schedule table.

ELECTRICAL LIGHTING DEVICE SCHEDULE									
Quantity	ID	DESCRIPTION	ELECTRICAL DATA		LAMP DATA		BASIS OF DESIGN		NOTES
			LOAD VA	VOLTAGE	QTY	WATTAGE	MANUFACTURER	MODEL OR SERIES	

Link the schedule to an external drawing

- 18 Select the schedule table.
- 19 On the Properties palette, click the Design tab.
- 20 Under Advanced ► External Source, for Schedule External Drawing, select Yes.
- 21 For External drawing, select Browse.

ADVANCED	
External Source	
Schedule external drawing	Yes
External drawing	*NONE*
Table Breaks	*NONE*
Direction	Browse...
Repeat title	Yes
Repeat headers	Yes
Manual heights	No
Maximum height	0.0
Spacing	15.0

- 22 In the Select a drawing file dialog, browse to My Documents\Autodesk\My Projects\Electrical Tutorial\Constructs\Lesson 3, select Completed_Lighting_Plan, and click Open.
- 23 With the schedule table still selected, right-click, and select Update Schedule Table.

ELECTRICAL LIGHTING DEVICE SCHEDULE									
Quantity	ID	DESCRIPTION	ELECTRICAL DATA		LAMP DATA		BASIS OF DESIGN		NOTES
			LOAD VA	VOLTAGE	QTY	WATTAGE	MANUFACTURER	MODEL OR SERIES	
19	A	600 x 1200 RECESSED STATIC TROFFER	96.0	230/1/60	4	32.0	LITHONIA		
2	A1	600 X 1200 RECESSED NIGHT LIGHT	96.0	230/1/60	4	32.0	LITHONIA		
12	B	RECESSED DOWN LIGHT	32.0	230/1/60	1	60.0	LITHONIA		
24	C	300 X 1200 PENDANT FLUORESCENT	96.0	230/1/60	2	32.0	LITHONIA		

- 24 Save the Electrical_Schedule drawing, and close it.

Exercise 5: Creating a Power Plan View

Create a general view drawing named Electrical_Power_Plan for the power plan. Create it as you created the lighting plan view drawing in Exercise 1. Use the Constructs/Lesson 4/Completed_Power_Plan drawing.

Exercise 6: Creating a Power Diagram View

Create a general view drawing named `Electrical_Power_Diagram` for the power distribution diagram. Select `Ground Floor` as the portion of the building to include, and select the `Completed_Power_Diagram` drawing in Lesson 5 as the construct to include.

In this lesson, you learned how to create different views using the same construct drawing. You also learned how to link a schedule table in a view drawing to a construct drawing. Next, you place your views on sheets to create construction documents.

Lesson 7: Creating Electrical Sheets

In this lesson, you learn how to place views on sheets to create construction documents.


You create new sheet drawings using the view drawings you created in the previous lesson. A set of completed sheet drawings is included for reference in the Lesson 7 Completed Sheets subset on the Sheets tab of the Project Navigator. Each sheet drawing name includes the lesson and the exercise number for the corresponding exercise. For example, the drawing `L07_E01 Electrical Lighting Plan` is the completed drawing for Lesson 7, Exercise 1 in this tutorial.

This lesson is sequential, and it is recommended that you complete the exercises in the order presented. It also requires that you have completed the view drawings in Lesson 6.

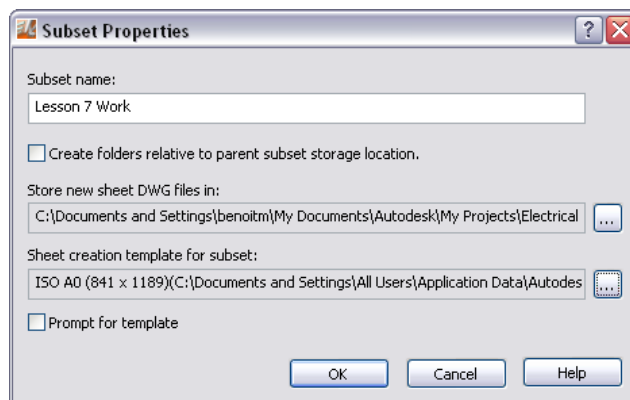
Exercise 1: Creating an Electrical Plan Sheet

In this exercise, you create a sheet drawing using the electrical plan view drawing.


Create a new sheet subset

- 1 In the Project Navigator, click the Project tab, and verify the current project is `Electrical Tutorial`. If not, use the Project Browser to specify this tutorial as the current project.
- 2 Verify that the current workspace is set to `Electrical`.
- 3 Verify that a drawing is open. If no drawing is open, click . (You cannot edit project settings, such as add a Sheets subset, unless a drawing is open.)
- 4 Click the Sheets tab.
- 5 Right-click `Electrical Tutorial`, and click `New ► Subset`.
- 6 In the Subset Properties dialog, for Subset name, enter `Lesson 7 Work`.

Leave Prompt for template deselected. For this tutorial, you will use the same sheet size for all sheets.



- 7 For Sheet creation template for subset, click .

- 8 In the Select Layout as Sheet Template dialog, under Drawing template file name, click .

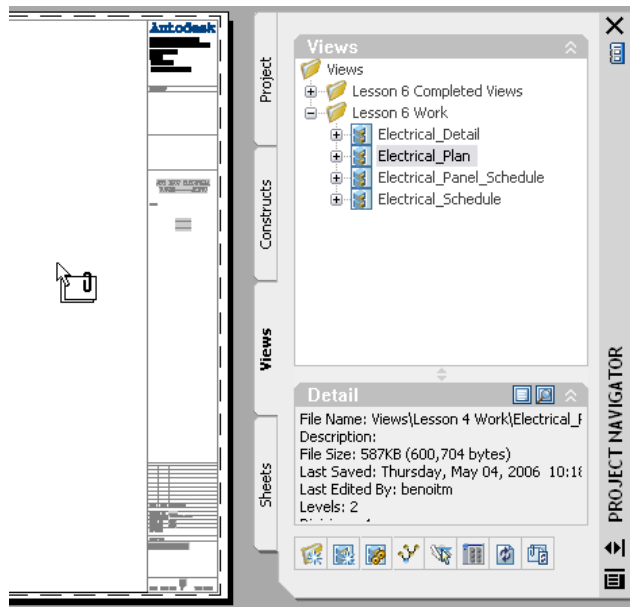
- 9 In the Select Drawing dialog, browse to the C:\Documents and Settings\All Users\Application Data\Autodesk\ACD-MEP 2008\enu\Template directory, select Aecb Sheet (Global Ctb).dwt, and click Open.
- 10 In the Select Layout as Sheet Template dialog, select the ISO A0 (841 x 1189) layout, and click OK twice.
The new sheet subset is added to the Sheets tab.

Create an electrical plan sheet

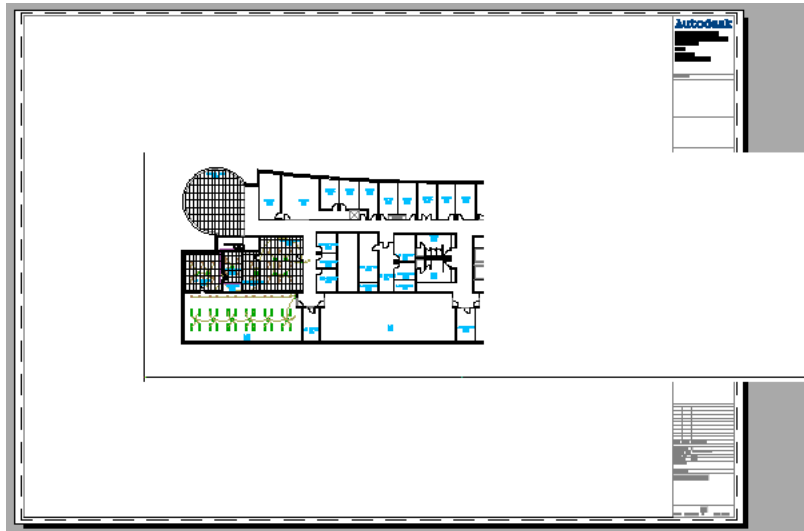
- 11 On the Sheets tab, right-click Lesson 7 Work, and click New ► Sheet.
- 12 In the New Sheet dialog, for Number, enter E-1.
- 13 For Sheet title, enter Electrical Plan.
Note that the file name is specified automatically using the number and sheet title.
- 14 Click OK.
The new sheet is added to the Lesson 7 Work subset.

Place a view on the sheet

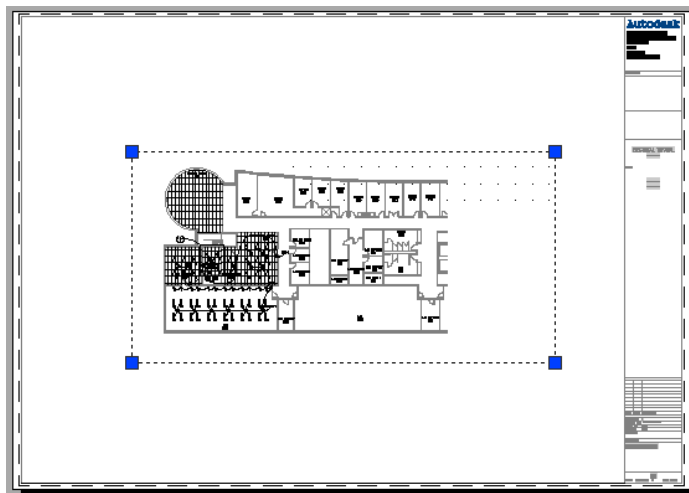
- 15 Double-click E-1 Electrical Plan to open it.
- 16 Click the Views tab in Project Navigator.
- 17 Under Views, expand Lesson 6 Work.
- 18 Drag Electrical_Plan onto the sheet, and release the mouse button.



- 19 Click to specify the insertion point for the lower-left corner of the view.

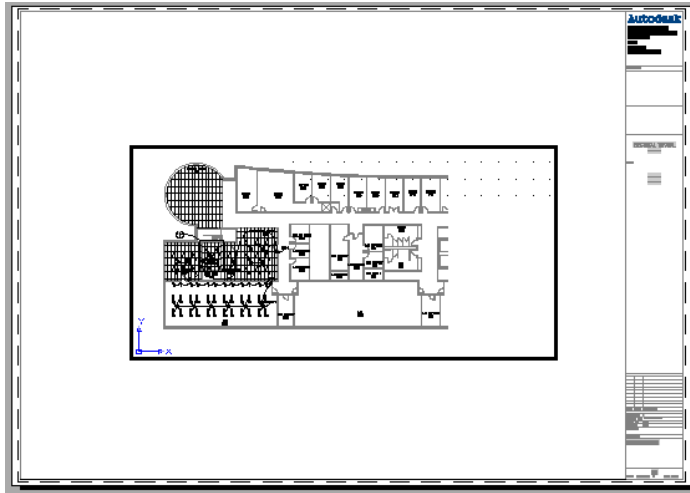


- 20 Select the boundary for the viewport, and resize it so that it fits on the sheet. Make sure the view drawing geometry is visible.



TIP You can move the viewport by selecting it, right-clicking, and clicking Basic Modify Tools ► Move.

- 21 The grid is visible in the viewport. To turn it off, first activate the model space view by double-clicking inside the viewport boundary.



- 22 On the application status bar, deselect GRID, and double-click outside of the viewport to return to paper space.

NOTE The Aecb Sheet (Global) template contains an incorrect setting for ceiling grid displays. The ceiling grid is displayed in the Electrical display configuration. Use the following steps to turn it off.

- Click Format menu ► Display Manager.
- In the left pane of Display Manager, expand Representations by Object under the current drawing name, and select Ceiling Grid.
- In the right pane, clear Plan in the Electrical - Plan column.
- Click OK to close Display Manager.

- 23 Pan and zoom on the title block. This sheet was created using a standard AutoCAD MEP sheet template. Note how the title and sheet number are automatically populated using the sheet information. You can add and edit text in the title block.

MARK	DATE	DESCRIPTION
PROJECT NO:		
CAD DWG FILE: E-1 ELECTRICAL PLAN.DWG		
DRAWN BY: [User]		
CHK'D BY: [User]		
COPYRIGHT:		
SHEET TITLE		
ELECTRICAL PLAN		
E-1		
SHEET	SHEET INDEX	OF TOTAL SHEETS

The sheet drawing references the view drawing, which in turn references the construct drawing. If you modify the construct drawing, just open the sheet to see the latest construct geometry.

- 24 Save the E-1 Electrical Plan sheet, and close the drawing.

In this exercise, you learned how to place a view on a sheet. Next, you create a sheet for the detail view.

Exercise 2: Creating a Detail Sheet

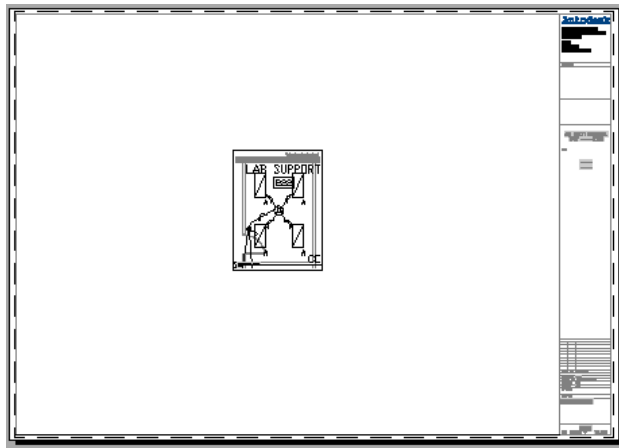
In this exercise, you create a sheet for the detail view. When you place the view on a sheet, the detail view number will automatically be added.

Create a new sheet

- 1 On the Sheets tab of the Project Navigator, right-click Lesson 7 Work, and click New ► Sheet.
- 2 In the New Sheet dialog, specify E-2 for number.
- 3 Specify Electrical Detail for Sheet title, and click OK.
- 4 On the Sheets tab, double-click E-2 Electrical Detail to open it.

Place a view on the sheet

- 5 Click the Views tab on Project Navigator.
- 6 Under Views, expand Lesson 6 Work.
- 7 Click and hold Electrical_Detail, drag it onto the sheet, and release the mouse button.
- 8 Leave the scale as 1:25, and specify an insertion point on the sheet.



NOTE The tags for the lights are visible on the sheet (which has an annotation scale of 1:25) because, earlier in this tutorial, you added the 1:25 scale representation to the tags in the construct drawing.

- 9 Double-click inside the viewport, verify that GRID is deselected, and double-click outside the viewport to return to paper space.
- 10 Pan and zoom to the detail title mark. Note that the detail number has been automatically added. This number is also added to the plan view drawing that contains the detail mark.

NOTE The Aecb Sheet (Global) template contains an incorrect setting for ceiling grid displays. The ceiling grid is displayed in the Electrical display configuration. Use the following steps to turn it off.

- Click Format menu ► Display Manager.
 - In the left pane of Display Manager, expand Representations by Object under the current drawing name, and select Ceiling Grid.
 - In the right pane, clear Plan in the Electrical - Plan column.
 - Click OK to close Display Manager.
-

- 11 Save the E-2 Electrical Detail sheet, and close the drawing.

In this exercise, you placed a detail view on a sheet.

Exercise 3: Creating a Panel Schedule Sheet

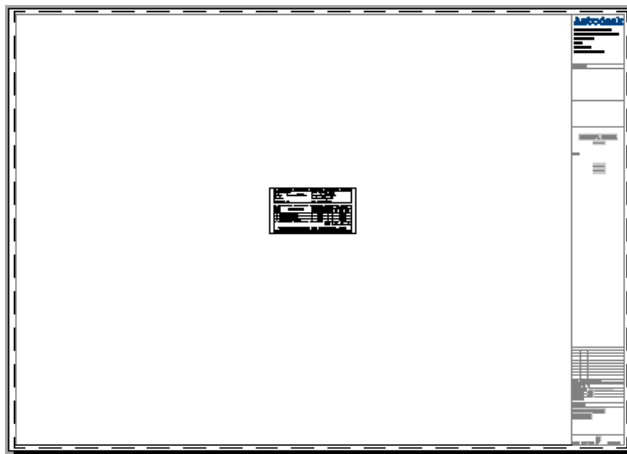
In this exercise, you place the panel schedule on a sheet.

Create a new sheet

- 1 On the Sheets tab of the Project Navigator, right-click Lesson 7 Work, and click New ► Sheet.
- 2 In the New Sheet dialog, specify E-3 for Number.
- 3 Enter Electrical Panel Schedule for Sheet title, and click OK.
- 4 On the Sheets tab, double-click E-3 Electrical Panel Schedule to open it.

Place a view on the sheet

- 5 Click the Views tab on Project Navigator.
- 6 Under Views, expand Lesson 6 Work.
- 7 Drag Electrical_Panel_Schedule onto the sheet, and release the mouse button.



- 8 Double-click inside the schedule viewport, deselect GRID, and double-click outside the viewport to return to paper space.
- 9 Save the E-3 Electrical Panel Schedule sheet, and close the drawing.

Exercise 4: Creating a Schedule Sheet

In this exercise, you place the schedule view on a sheet.

Create a new sheet

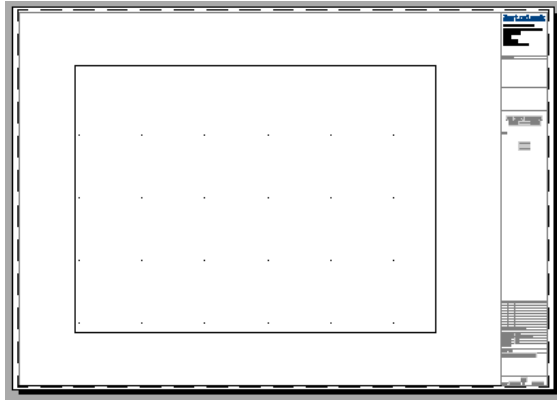
- 1 On the Sheets tab of the Project Navigator, right-click Lesson 7 Work, and click New ► Sheet.
- 2 In the New Sheet dialog, specify E-4 for number.
- 3 Specify Electrical Schedule for Sheet title, and click OK.
- 4 On the Sheets tab, double-click E-4 Electrical Schedule to open it.

Next, you need to add a viewport to the sheet. You cannot add a schedule to a sheet unless you configure a viewport for it on its view or sheet drawing.

Create a viewport

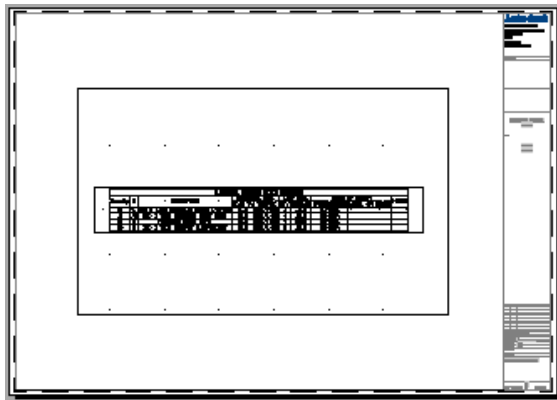
- 5 Click View menu ► Viewports ► 1 Viewport.

6 Specify the corners for the viewport on the sheet.



Place a view on the sheet

- 7 Click the Views tab on Project Navigator.
- 8 Under Views, expand Lesson 6 Work.
- 9 Drag Electrical_Schedule onto the sheet, and release the mouse button.
- 10 Right-click, specify the scale as 1:50, and specify an insertion point on the sheet.



- 11 Select the viewport you created previously, and press Delete to erase it.
- 12 Double-click inside the schedule viewport, deselect GRID, and double-click outside the viewport to return to paper space.
- 13 Save the E-4 Electrical Schedule sheet, and close the drawing.

In this exercise, you learned how to place a schedule on a sheet. Next, you learn how to create a cover sheet.

Exercise 5: Creating a Power Plan Sheet

Create a sheet named E-5 Electrical Power Plan, and place the power plan view drawing on it.

Exercise 6: Creating a Power Diagram Sheet

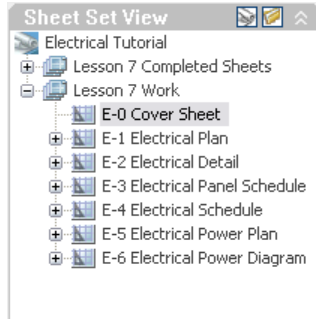
Create a sheet named E-6 Electrical Power Diagram, and place the power diagram view drawing on it. Before you specify the insertion point for the view drawing, right-click, and change the scale to 1:25.

Exercise 7: Creating a Cover Sheet

In this exercise, you learn how to create a cover sheet. You insert a sheet list table that is dynamically linked to all sheets in the set.

Create a new sheet

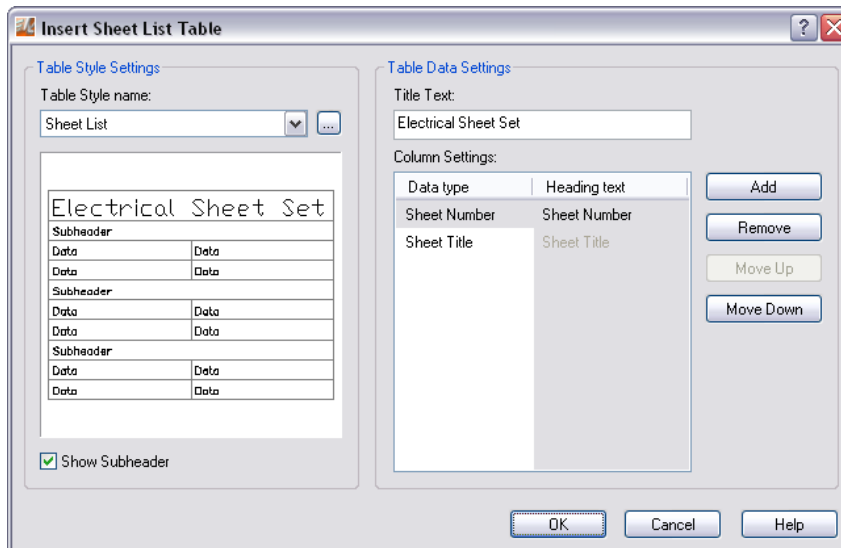
- 1 On the Sheets tab of Project Navigator, right-click Lesson 7 Work, and click New ► Sheet.
- 2 In the New Sheet dialog, specify E-0 for Number.
- 3 Enter Cover Sheet for Sheet title, and click OK.
- 4 Sheets in the set are ordered based on their location in the subset. On the Sheets tab, move the cover sheet to the beginning of the subset by dragging E-0 Cover Sheet and dropping it above E-1 Electrical Plan.



- 5 On the Sheets tab, double-click E-0 Cover Sheet to open it.

Add a sheet list

- 6 On the Sheets tab, right-click Electrical Tutorial, and click Insert Sheet List.
- 7 On the Insert Sheet List Table dialog, specify the following settings:
 - For Table Style Name, select Sheet List.
 - Select Show Subheader.
 - For Title Text, enter Electrical Sheet Set.



- 8 Click OK.
- 9 Specify the location for the sheet list in the drawing.
- 10 Zoom in to view the sheet list.

Note that the sheets in the completed subset are included as well. The sheet list table detects all sheets in the project sheet set.

Electrical Sheet Set	
Lesson 7 Completed Sheets	
L07_E00	Electrical Cover Sheet
L07_E01	Electrical Lighting Plan
L07_E02	Electrical Lighting Detail
L07_E03	Electrical Schedules
L07_E04	Electrical Power Plan
L07_E05	Electrical Power Diagram
Lesson 7 Work	
E=0	Cover Sheet
E=1	Electrical Plan
E=2	Electrical Detail
E=3	Electrical Panel Schedule
E=4	Electrical Schedule
E=5	Electrical Power Plan
E=6	Electrical Power Diagram

TIP As you add or remove sheets in a project, you can update the sheet list table by selecting its outside boundary, right-clicking, and clicking Update Sheet List Table.

- 11 Save the E-0 Cover Sheet drawing, and close it.

In this exercise, you learned how to create a cover sheet with a sheet list. Next, you publish the sheet set to DWF™.

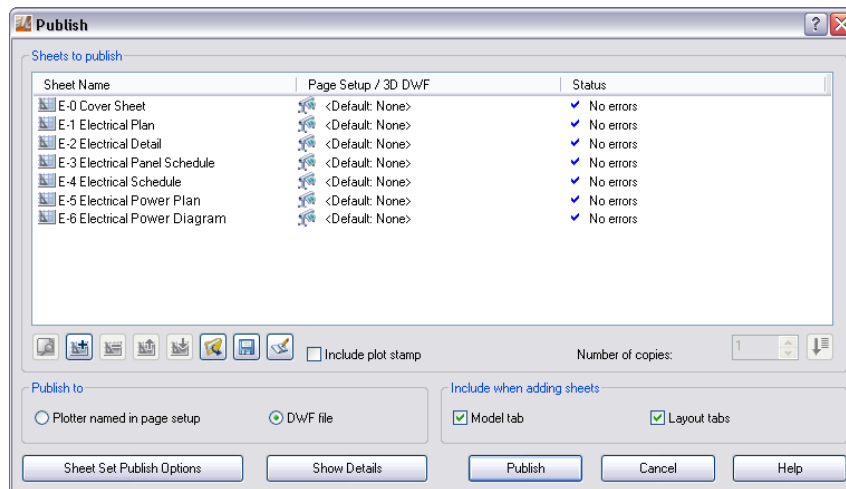
Exercise 8: Publishing the Sheet Set

In this exercise, you publish the sheet set to DWF.

- 1 On the Sheets tab of the Project Navigator, right-click Lesson 7 Work, and click Publish ► Publish Dialog Box.

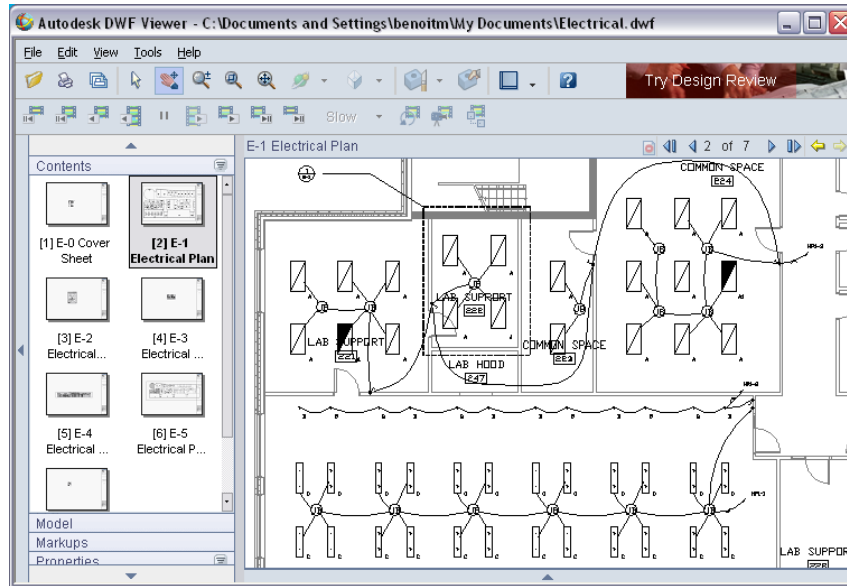
In the Publish dialog, under Sheets to publish, the sheets in Lesson 7 Work are displayed in the same order as they appear on the Sheets tab. The sheets in the DWF file will be ordered the same.

- 2 Under Publish to, select DWF file.



- 3 Click Publish.
- 4 In the Select DWF File dialog, browse to My Documents.
- 5 Enter Electrical.dwf for File name, and click Select.
- 6 When publishing is complete, use Windows® Explorer to browse to My Documents, and double-click Electrical.dwf to open it.
- 7 The DWF sheet set opens. In the left pane, click a drawing to view it in the right pane.

The DWF file contains live links. You can click a drawing title in the sheet set list to view that drawing. Note the detail mark on the E-1 Electrical Plan sheet. You can click the mark to switch to the detail sheet.



For reference, a completed sheet set is included in the Electrical Tutorial\Completed Sheet Set directory.

In this lesson, you learned how to create sheets. You also learned how to order a sheet set and create a dynamic sheet list. You published the sheet set to DWF and viewed the DWF file.